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# USSR Report

MILITARY AFFAIRS

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AVIATION AND COSMONAUTICS

No. 1, Jan 1983

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8 August 1983

USSR REPORT  
MILITARY AFFAIRS

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## AVIATION AND COSMONAUTICS

No. 1, Jan 1983

Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow.

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## IMPORTANCE OF UNIT COMMANDER TO TRAINING PROCESS NOTED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 83 (signed to press 3 Dec 82)  
pp 6-8

[Article by Col Gen Avn S. Golubev, Hero of the Soviet Union, Honored Military Pilot of the USSR: "The Commander--Organizer of Combat Training"]

[Text] Important and difficult missions are facing the men of the Air Forces in the new training year. Their accomplishment will depend greatly on the commanders and their ability to direct the efforts of the personnel toward the unconditional accomplishment of the plans for combat and political training, to direct the training-indoctrinational process, to organize and control flights, and to monitor the course of socialist competition.

In accordance with the Interior Service Regulations of the Soviet Armed Forces, the commander bears responsibility for the combat readiness of the unit or subunit entrusted to him, for the combat and political training, indoctrination, military discipline, and political-moral condition of the personnel, and the successful accomplishment of combat missions. Depending on the post which he occupies, each commander has many and other specific duties. But the main one is to teach his subordinates to master their weapons skillfully and bring up worthy defenders of the socialist fatherland.

The combat training of the men is the continuous and creative process of the knowledge, acquisition, and improvement of skills connected with the mastery of systems of contemporary complex weapons and the formation of physical endurance and moral-psychological steadfastness. The constant development of military affairs and the solution of problems of combat readiness which are becoming more and more complex require of commanders profound communist conviction, vast professional knowledge, and the improvement of pedagogical skill which permits more effective conduct of the training and indoctrination of subordinates.

Each year poses new problems and more difficult and responsible tasks for the personnel of the Air Forces. In order to determine the path to their accomplishment correctly and forecast the further course of combat training, it is very important to glance back at the path which has been traveled, analyze the results of the work, disclose and eliminate shortcomings, and disclose unused reserves.

The last training year was special for the aviators as well as for the entire Soviet people. It was the year of the 60th anniversary of the USSR's formation. In socialist competition under the slogan, "Reliable defense for the peaceful labor of the Soviet people!" the personnel of the units and subunits attained their planned positions. As final checks showed, the obligations assumed by the men were accomplished completely in the majority of units. The plans for combat improvement were realized with high quality. The professional and moral-political level of flight and technical engineering personnel and the specialists of supporting units rose significantly. The aviators greeted the glorious jubilee of the USSR with high combat readiness. The positions achieved are the foundation on which the entire combat training process will be built in the coming year. It is namely in this way that the results of military labor are understood and evaluated in the leading aviation units. Using the experience which has been accumulated, the command is directing all efforts toward the successful accomplishment of the outlined plans.

During the past year, great successes were achieved by the aviators of the Guards bomber regiment which was the initiator of socialist competition in the Air Forces and is commanded by Guards Colonel V. Sadikov. The aviator-Guardsmen accomplished the training plans and obligations and the regiment retained the title of excellent. A high-class crew has been trained for each airplane. The times to bring the subunits to combat readiness have been reduced. The average grade is 4.6 points for the basic professional disciplines and combat employment.

In their daily activity the regimental commander, staff, and political department were guided by the main indicator: by the high readiness of the personnel and the combat equipment and their ability to conduct combat operations under the difficult conditions of contemporary battle. Directing the activity of party and Komsomol organizations and of all aviators of the unit toward the struggle for a high final result, they constantly remembered that it can only be attained through the well organized, harmonious joint actions of the entire collective. Firm military discipline, military comradeship, the solidarity of the crews, detachments, squadrons, and supporting subunits, profound knowledge of their equipment and weapons, and the high moral-political spirit of the personnel became necessary conditions in the successful accomplishment of the assigned missions.

On a tactical flying exercise which crowned the final check, the crews demonstrated excellent flight ability and high tactical and firing skill. The technical-engineering personnel and junior aviation specialists worked clearly and smoothly. Exceeding the standards, they prepared the aviation equipment and armament for the sorties quickly and with high quality. The military aviators showed by deed that the weapons entrusted to them by the motherland are in reliable hands. Unquestionably, this is the result of the skillful, purposeful activity of the commander--the organizer and leader.

However, the Guardsmen are not content with what has been attained. The tempo in combat and political training which they have set in the new year shows that they see their shortcomings and unresolved problems and are able to find unused reserves and put them into action purposefully. Questions of flight safety, economy of material resources, rationalization work, and strengthening military discipline, order, and organization are under the unremitting attention of the commander, staff, political department, and party and Komsomol organizations. A special place in the

combat training of the aviators is occupied by the operational-tactical training of commanders and crew members. And this is absolutely correct, for the crew of a long-range bomber should be able to accomplish an assignment independently at a very high level. Naturally, first of all the commander should clearly understand the situation, be able to estimate its changes from the slightest signs, and adopt competent, expedient decisions. Such is the calling of the times.

Today the international situation is difficult as never before. The administration of the United States has initiated broad psychological warfare against the USSR and other socialist countries and is maintaining a direct course toward building up military danger. Militant circles of American imperialism are trying to thrust relations between countries and peoples onto the path of confrontation and balancing on the edge of war. Moreover, President Reagan has summoned his NATO partners to a global anticommunist "crusade." And these reckless ideas are being reinforced by practical deeds. The United States and its allies are constantly building up their combat might and reequipping all the services of the armed forces with new weapons systems, including nuclear weapons.

The policy "from a position of strength" is reflected in a strategy of "direct opposition" which envisions the creation of "incontestable military superiority" and is worked out in detail in the military-strategic concepts of "general (total) forces," "essential equivalency," "strategic mobility," "geographic (horizontal) escalation," "ocean strategy," and others like them. They have one meaning and goal: to impose its dictates on countries and peoples and ensure the "world leadership" of the United States and the complete domination of American capital. In implementing its adventuristic concepts the Washington administration is interfering coarsely in the internal affairs of sovereign states, provoking and fanning military conflicts, and supporting aggressors in every possible way. An example of this is the clash of Britain and Argentina over the Falkland (Malvinas) Islands which belong to Argentina, the marauding aggression of Israel in Lebanon, and other anti-popular actions in various parts of the world.

In a situation of military psychosis which is being fanned by Western propaganda, the Communist Party and the Soviet government are doing everything to weaken the threat of nuclear war which is hanging over mankind, to strengthen international security, tirelessly to improve the country's defense, and to maintain the greatest vigilance. The Soviet Armed Forces are a mighty factor for peace and security and a reliable means for restraining aggressive forces.

In his speech at the conference of command personnel of the Soviet Armed Forces in the Kremlin, Comrade L. I. Brezhnev noted: "The time is now such that the level of the Armed Forces' combat readiness should be even higher. We should be engaged in improving combat readiness constantly, exceptionally responsibly, proceeding from growing requirements. Then no accident will catch us unawares."

The contemporary situation requires of commanders exceptionally high responsibility for the combat training of crews and subunits. Simplification and indulgences in combat training are absolutely impermissible. It is necessary constantly to make the training situation more difficult; here, special attention should be paid to the ability of commanders to direct the combat actions of groups and subunits in the air. Thanks to the concern of the party and the government, the Air Forces are

equipped with contemporary combat equipment and weapons which permit accomplishing missions of any complexity. The personnel of the Air Forces are persistently comprehending the laws of contemporary battle, improving their professional skill, and raising combat readiness.

The high-quality accomplishment of the plans for combat and political training depends to a great extent first of all on how profoundly the commander himself understands the missions facing him and is able to bring their content to the minds and hearts of subordinates, distribute available men and equipment, stir people up, and carry them along for the accomplishment of forthcoming missions by personal example. Experience shows that this turns out best for those commanders who know their subordinates and the capabilities of the collective well and skillfully rely on the party and Komsomol activists.

Quite recently, Lieutenant Colonel V. Andrianov assumed command of an air regiment. In a short time he succeeded in proving himself a good organizer and demanding commander, a skillful educator and teacher, and a sensitive and responsive leader. The young commander passed through all stages of service growth from pilot to the post now occupied in this unit. He is well known in the unit and he maintained friendly relations with many fellow-servicemen. At first glance, this could create some difficulties. But as it turned out, it only helped him. The officer oriented himself in the situation correctly. Knowing the people, he consistently and purposefully began to assert firm military order in the regiment. And this, as is known, is not only exemplary interior order in the barracks but also, first of all, the clear organization of combat and political training, the maintenance and operation of equipment and weapons, the clear performance of guard and interior services by the aviators, correct prescribed mutual relations of the servicemen, the strict observance of the daily routine, and the wise organization of the men's work and rest.

The commander has a great many concerns. Each day, various urgent problems arise which require a competent and effective solution.

At first, some young commanders are literally lost in the mass of everyday matters and work, as they say, indefatigably, and there are many omissions. What is the matter here? We will try to examine this.

In performing official duties, it is very important to determine the main thing to which attention should be turned first. But in aviation, as is known, there are no secondary problems; all affect the quality of combat and political training one way or another. From the very beginning of his commander's activity Lieutenant Colonel Andrianov understood firmly that the core of his work and the fundamental principle for the sake of which the entire combat training process is structured is the planned training of aerial fighters for the conduct of combat operations under the difficult conditions of contemporary combat. This is the paramount, constantly operating mission and it should be accomplished with the complete straining of strength. As the one-man commander, the commander bears responsibility for this. Andrianov was able to rally the staff officers around him, distributed spheres of responsibility among them, aimed the party and Komsomol activists at the unconditional accomplishment of the tasks facing the subunits, and placed the course of combat training under strict control.

The first thing on which the commander concentrated attention was the instilling in the men of communist conviction which presumes the organic combination of theoretical knowledge with practical deeds and with the men's clear accomplishment of their military duty and the requirements of the regulations and the oath, the molding of a sense of personal responsibility for the assigned matter, and the development of initiative and self-criticism in evaluating their labor. For this, it was necessary to raise the effectiveness of the officers' Marxist-Leninist training, the political instruction of the warrant officers, and the political lessons of the privates and noncommissioned officers, and to raise the combat vitality of the party and Komsomol organizations in indoctrinational work with the aviators.

The unit political deputy became his assistant and good advisor in these undertakings.

The commander, staff, and political department directed their main attention toward the tactical flying training of the crews. For fighter-bombers are called upon to work first of all in the interests of the Ground Forces and ensure their success in the attack and defense. This means that in order to coordinate, let us say, with tank or motorized rifle subunits each pilot should have good knowledge of their tactics and principles of combat employment. It is important to link theory with practice, that is, to make the flights, as applicable to the tasks of their branch of aviation, a genuine school of tactics. It is not by chance that at the final check the flight personnel demonstrated good knowledge of tactics and acted skillfully on the tactical flying exercise.

The experience of the leading units shows that if commanders, staffs, and political organs place main emphasis on aerial-tactical training in organizing combat instruction, the level of combat readiness is considerably higher. What does this mean and how does it look in the system of combat and political training? The annual plans envision the training of flight personnel by tasks and periods of instruction. The readiness of the crews and subunits for the accomplishment of various missions is checked on a tactical flying exercise of the corresponding branch or element of aviation. Thus, theoretical lessons, drills, and flights--these are the gradual training of the personnel for tactical flying exercises.

Practice shows that the greatest effectiveness is attained when instruction is conducted purposefully, by strictly defined stages in accordance with the concept of the exercise. On the first stage with the flight personnel and the officers of the staff, combat headquarters, and corresponding services theoretical quickie exercises are organized on which problems of the tactics and combat employment on the subject of the tactical flying exercise are examined. Proceeding from the assigned mission and the situation, the officers simulate combat operations and work out versions of an effective decision, methods for launching strikes and coordination with other branches of aviation, and tactical procedures for overcoming air defense. In other words, as a result of the advance preparation, the squadron's flight personnel obtain a clear impression of future exercises.

The second stage includes working out the skills of the flight personnel in piloting technique, aircraft navigation, and in combat employment first on simulators and then directly in the air day and night under difficult weather conditions. Here, it is very important to acquire skills in the employment of those means of destruction with which the crews will work on the tactical flying exercise.

On the third stage, the flight personnel work out tactical procedures with the conduct of combat operations as pairs, flights, and groups with various tactical purposes, again in accordance with the subject of the lesson and on the basis of the results of simulation. In the period for passing through the training program, special-purpose flights are conducted with the accomplishment of several exercises of the same type. Thus, each flight should bring maximum value to the pilot for the improvement of his professional skill.

On the concluding stage, the squadron commander conducts a tactical flying exercise. Undoubtedly, here it is very important to create a situation as close as possible to one of real combat. This is attained by various ways and means. The main thing is that the concept of the exercise, situation, and conditions be worked out by the regimental staff under the direct leadership of the commander. Otherwise, the effectiveness of the exercise will be low. A situation where the commander himself determines the mission and evaluates his work cannot be permitted. This is the prerogative of the senior commanders and more experienced methodologists. The tactical flying exercise is the highest form of troop instruction. Consequently, only the higher commander can grade the correctness of the decision which has been adopted. The instructiveness of the tactical flying exercise depends completely on how well the regimental commander, as the leader of the exercise, creates a situation and the dynamics of combat operations and stipulates the opposition of the "opponents" in accordance with the state of training of the flight personnel and the capabilities of material and technical support.

It is very important to make the exercise two-sided with the designation of a real enemy, to game episodes of fighting of fighters with fighters, and to work out their coordination with attack aviation during its accompaniment and covering of ground forces and during the accomplishment of other specific missions. It is necessary to use mobile tactical ranges with maximum return, to attract air defense means and ground-based electronic warfare means to participate in the flying tactical exercise, and to set out mockups of the combat equipment of a specific enemy on the ranges in exact conformance with the rules for their emplacement under actual conditions. Flights over the complete distance with the accomplishment of combat missions and a landing on a cooperating airfield provide unquestioned value for the flight personnel.

Each year, young replacements from the schools arrive in the unit. Just as formerly, the instructor personnel face the task of putting them into formation quickly and methodically. This work is difficult, strained, and important. It requires of commander-indoctrinators sensitivity and attention, profound knowledge of Soviet military pedagogy and psychology, and high flying and methodological skill. For the instructor faces a task of state importance--to mold from the young aviator a skillful pilot-fighter who is boundlessly devoted to his motherland and a patriot and citizen.

For the successful accomplishment of missions in the new year, it is necessary to create in the combat collectives a healthy moral-psychological climate and high moral relations between all categories of servicemen. It is necessary to make wider



use of moral incentives of socialist competition and to evaluate the results which have been attained accurately and objectively. It is the guarantee that the men will work smoothly and with the greatest return and that the plans for combat training will be accomplished completely and with high quality.

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## WORK WITH SQUADRON PERSONNEL DISCUSSED

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p 9

[Article by Maj B. Makarevich: "Not by Stereotype, but Creatively"]

[Text] The tempo of the tactical flying exercise picked up. Some airplanes soared upward while others taxied out for takeoff. And the more intensive the flights became, the more clearly did the aviators of the squadron commanded by first-class military pilot Major V. Podmolod work. Party and Komsomol meetings took place here on the eve of the LTU [tactical flying exercise]. Ensuring the exemplariness of the communists and Komsomols in the high-quality accomplishment of the assigned missions was discussed. The squadron commander and his political deputy conducted a conference with the activists, distributed duties among them, and outlined work plans. Special attention was devoted to the publicity of socialist competition and the effective dissemination of leading experience.

And now, at the height of the tactical flying exercise, the party and Komsomol activists, in accomplishing their service duties, succeeded in telling their comrades about the achievements of the leaders and helping the laggards. In the course of the exercise, they issued operational news sheets and news flashes, organized the listening to radio broadcasts, and in the pauses between aerial "battles," the exchange of the experiences of the best pilots, technicians, and mechanics.

In preparing an airplane for repeated takeoff. Senior Lieutenant of Technical Service V. Kislyuk discovered a malfunction. There was little time at his disposal. But the officer was able to eliminate the defect in such a short time. The aircraft took off into the sky exactly at the designated time.

The squadron's Komsomol activists headed by Senior Lieutenant V. Bakharev tried to use this instance to instill in the aviators vigilance, zeal, and responsibility not only for the accomplishment of their own duties, but also for the active accomplishment of the common mission facing the subunit.

When the time came to sum up the results of the competition, each aviator had good knowledge of how things stand in the adjacent crew, flight, and group, and where his rivals are outstripping his collective and where they are inferior. This caused the desire to work even better and attain higher results in combat training. According to the results of the socialist competition in honor of the 60th anniversary of the formation of the USSR, the squadron occupied the leading place in the regiment.

What helps the men to attain success? In answering this question the soldiers, noncommissioned officers, warrant officers [praporshchik], and officers acknowledge unanimously: the atmosphere of strict exactingness, the encouragement of independence and initiative, and military comradeship and mutual assistance which reign in the collective. Such an environment contributes to a rise in the labor activity of the aviators and excludes complacency and formalism. Here ideological and political-indoctrinational work with the personnel is planned thoughtfully and conducted purposefully and emphasis is placed on the effectiveness of the measures being conducted.

But here, unfortunately, the aviators of the squadron where Senior Lieutenant S. Vershinin serves for the present still cannot attain convincing successes in combat training and socialist competition. What is the reason? We will try to examine this, turning to the case which occurred in the subunit not so long ago.

On a dual-control aircraft being piloted by Senior Lieutenant Vershinin, the engine stopped. This occurred on the landing approach, several hundred meters from the beginning of the concrete. The pilot managed to land the aircraft safely. In the critique of the incident, it was learned that the rocket carrier was in good working order and Vershinin acted correctly. The fuel tanks simply ran out of fuel.

For a long time, it was not necessary to reveal those guilty of the precondition. The aircraft technician, Lieutenant of Technical Service V. Barygin did not completely accomplish the post-flight preparation upon completion of the preceding flight shift and did not check if the aircraft had been refueled. He also forgot to do this the following day during preliminary preparation. Barygin's immediate superior, Senior Lieutenant of Technical Service N. Gushchin, did not monitor the actions of his subordinate. The pilot had entrusted the aircraft to the technician and did not conduct a complete preflight inspection of the aircraft. So as a result no one discovered that the rocket carrier had not been completely refueled.

And so the precondition. This incident was examined in the subunit and lessons were conducted on various types of preparation of aviation equipment for flights, while measures were adopted to intensify the monitoring of the specialists' work. And both the pilot and the technicians were held strictly accountable for negligence.

But is this the only reason? For these officers were considered to be experts in their work and Barygin's airplane was among the excellent ones.

Evidently, behind these evaluations we should also look for the solution to the reasons for coarse violations in the maintenance of aviation equipment. For it is not enough to consider one or another serviceman a good specialist. But namely how is he distinguished among the others, in what is he strong, what shortcomings can be noted in his character, and how do they influence his accomplishment of his service duties? The subunit commander, his deputies, and the party and Komsomol activists could not answer such questions completely and convincingly. Evidently, in propagandizing the experience of the leaders here they limit themselves to general phrases and do not disclose the essence of the leaders' achievements or the errors of the laggards. And, as is known, indifference and formalism hinder a good and necessary cause.

Is it not because in the squadron and on flights competition between technicians and mechanics is organized in a stereotyped manner? The names of those who distinguished themselves during preflight preparations can be read in the operational news sheet. But the heat of the flights increased here. It would seem that the tempo of party-political work should also become more intensive. Here party and Komsomol activists and unofficial propagandists should select a convenient time to sum up the results of the first hours of work, name the best people, tell about their achievements, and direct the others toward shock labor and the raising of professional vigilance. However, such a form as graphic agitation is poorly used.

Such an approach to the matter, of course, does not contribute to an increase in activity and raising the effectiveness of socialist competition. The aviators' interest in the final results is lowered.

At the 6th Army-Wide Conference of Secretaries of Primary Party Organizations, it was noted that, being genuine centers of ideological-indoctrinational work, the party organizations should conduct it daily, without interruptions and let-ups, and the more active and persistent, the more difficult the conditions and the more strained the situation in which the men operate. The party activists of the squadron where Senior Lieutenant S. Vershinin serves proved to be unequal to the occasion.

And how about officers Barygin and Gushchin? For violation of the rules for maintaining aviation equipment the commander punished them and the party organization held them strictly accountable as communists. The leaders of the Air Force Engineer Service outlined a number of measures which were called upon to mobilize the personnel for accident-free work. But all this, as they say, was a kick in the tail. But here serious and well-thought-out preventive work is still conducted poorly for the present.

The 26th Congress of our party and the subsequent plenums of the CPSU Central Committee are aiming the Soviet communists at working creatively and giving battle to formalism and stereotype. The following of this course is the correct path for communists and all aviators of the subunit and the regiment as a whole who are accomplishing difficult and many-faceted missions on the indoctrination and training of skillful, ideologically tempered aerial fighters.

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## IMPROVEMENT IN MARXIST-LENINIST INDOCTRINATION URGED

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pp 10-11, 22

[Article by Col V. Makeyev, chief of Department of Propaganda and Agitation,  
deputy chief of Air Forces Political Directorate: "An Important Political Task"]

[Text] In the grandiose program of communist creation outlined by the 26th CPSU Congress, questions of raising the effectiveness of ideological work as a whole and party training as its most important component part are also developed. This is proper since the greater the scale of and the deeper the socio-economic transformations which occur in our country and the more acute the ideological struggle in the world arena, the greater the significance acquired by the ideological-theoretical training of the communists and the entire Soviet people.

Steadily following the Lenin behests, the CPSU is constantly concerned about the further development of revolutionary theory on the basis of Marxist-Leninist teaching. Thus, the party's instructions on ideological questions and the decree of the CPSU Central Committee of 26 April 1979, which was called a long-term document at the congress, formed the basis of the subsequent decree of the party Central Committee of 26 May 1981, "On the further improvement of party training in light of the decisions of the 26th CPSU Congress," which is one of the important measures in the restructuring of ideological work.

On the basis of the decree, the Soviet Minister of Defense and the chief of the Main Political Directorate of the Soviet Army and Navy issued the corresponding instructions which decreed important tasks for the further improvement of the Marxist-Leninist training of officers, of political instruction of warrant officers [praporshchik], of political lessons with soldiers and noncommissioned officers, of all elements of party education, and also improving their results through the high scientific level of instruction, intensification of its offensive spirit, and strengthening its tie with life.

Ways for the realization of these urgent problems were also discussed at a conference of ideological workers of the Armed Forces which took place last October. In the materials of the conference it was directly stressed that the CPSU requires the conduct of a lively, confidential talk with people, ensuring a high scientific level of propaganda and agitation, and intensifying their effectiveness and specificity and aggressive nature.

Being guided by these instructions, commanders, political organs, and party organizations of aviation units and subunits conducted important organizational work during the last training year which was directed toward raising the quality and effectiveness of political training, improving the ideological-political, military, legal, and moral indoctrination of the personnel, molding in the servicemen a keen sense of responsibility for the security of the motherland, and strengthening the combat might of the Armed Forces. This is shown by the high results in combat and political training with which the military aviators greeted the 60th anniversary of the formation of the USSR and by the results of the socialist competition in the Air Forces under the slogan, "A reliable defense for the peaceful labor of the Soviet people!"

At the 26th CPSU Congress, it was noted that the combat potential of the Soviet Armed Forces is the strong alloy of high technical equipping, military skill, and invincible morale. It is namely in this way that the collective portrait of the personnel of the Air Forces who are boundlessly devoted to the great Leninist party and the Soviet people, are mastering contemporary combat aviation complexes to perfection, and are always ready to rebuff any aggressor is seen. These qualities are instilled in the Soviet aviators in the course of strained soldierly labor by all forms of ideological and political-indoctrinational work, including political training.

Unquestionably, in the last training year it rose to a new, higher level. Special attention was devoted to lectures and seminar lessons on the materials of the 26th CPSU Congress. Broad propagation was received by additional lecture cycles on the most important questions raised at the congress, by theoretical conferences, by the preparation of papers and scientific reports, by the discussion of monographs and articles on military-political problems, by the appearance before the students of delegates to the 26th Party Congress, scientists, personnel of local party and Soviet organs, and specialists of industry and agriculture, and by individual and group consultations. No small significance was attached to the profound study of the Lenin ideological-theoretical heritage. The lecturers stressed the regularity of the increase in the party's leading role in the life of Soviet society, examined the problems of the ideological struggle in the international arena, and noted the further strengthening of the friendship and brotherhood of the peoples of the USSR.

Approval of every type is also merited by the practice which took root in the last training year for the regular discussion, in the political organs and party and Komsomol organizations, of questions connected with the political instruction of the aviators and for examination of the course of the study of documents of the 26th CPSU Congress, plenums of the party Central Committee, and the works and speeches of Comrade L. I. Brezhnev at conferences and meetings. Also favorable is the fact that in the last training year the activity of the leader personnel in the organization not only of Marxist-Leninist training of officers, but also the political instruction of warrant officers and political lessons with soldiers and non-commissioned officers, was also raised in many aviation garrisons and higher educational institutions of the Air Forces.

It can be said with confidence that improvement of the quality of political training of Air Forces personnel in the year of the 60th anniversary of the USSR's formation had a beneficial effect on raising the ideological tempering of the aerial fighters and furthered a growth in their combat ability and professional skill.

For example, in the aviation units where the propagandists are Majors V. Vasil'yev, G. Nachmitdinov, and N. Basanenko and Captain V. Yemel'yanov commanders, political officers, and party and Komsomol organizations are objectively engaged in the political training of the aviators. To increase the propagandist skill of group leaders, consultations are conducted regularly on the urgent problems of the CPSU's domestic and foreign policy, materials of the 26th Party Congress, and the works of the Marxist-Leninist classics. Here, they are constantly concerned that graphic aids are used on lectures and seminars and that the students are provided with the necessary political literature and primary sources. All this permitted the attainment of a high ideological and methodological level of the lessons and raising the ideological tempering of the personnel as a whole to a new stage. During the final annual inspections the aviators of these military collectives demonstrated profound political knowledge, the ability to analyze complex international events, the correct understanding of their constitutional duty to the motherland, and the ability to draw the appropriate conclusions to raise combat readiness and strengthen military discipline.

The experience of the ideological and political-indoctrinational work of the leading troop collectives shows that success in this important matter is determined to a great extent by the propagandists' correct understanding of the problem of the relation of theory and practice and by the ability to structure the training-indoctrinational process in such a way that the aviators' study of the theory and policy of the CPSU furthers in them an active life's position and has a favorable influence on their service activity and the raising of aerial ability and combat skill. "For the propagandist," it was stressed in the accountability report of the CPSU Central Committee to the 26th Party Congress, "is the principal figure in the system of party training. How the seminars, political schools, and universities will be depends namely on them to a great extent: will they be a place where boredom reigns at times or where the prescribed hours are only 'served' or, on the contrary, will they become actual centers of living party thought and word everywhere? The attitude of people toward party training depends first of all on the party's ideological and propagandist activists.

It is not by chance that in the decree, "On further improvement of party training in light of the decisions of the 26th CPSU Congress," and in the materials of the Army-Wide Conference of Ideological Personnel of the Armed Forces special attention is devoted to the necessity to improve the selection, training, and indoctrination of propagandists, leaders of all forms of party work, and teachers in universities and departments of Marxism-Leninism since the success of party education depends on their methodological skill and their ability to react effectively to the spiritual demands of the students.

From this follows the most important task for commanders, political organs, and party committees and bureaus of aviation units in the selection, indoctrination, training, and retraining of propagandist personnel. This is one of the main sectors of party leadership of the ideological tempering of the motherland's winged defenders. There are many experienced, highly-erudite propagandists in the Air Forces. Among them are Doctors of Philosophical Sciences Generals V. Khalipov and G. Suglov, Honored Culture Worker of the RSFSR Colonel A. Ignat'yev, officers N. Buyanov, V. Velichenko, and S. Yegupov, and many others. Profoundly reasoned speeches, the constant striving to raise their theoretical and methodological level,

devotion to communist ideals, political maturity and the ability to make a comprehensive analysis of events which are taking place--these are the qualities which are inherent in these propagandists. Life urgently requires that their experience be widely introduced into the practice of all ideological and political-indoctrinational work.

Today, when our ideological opponents have intensified their subversive activity and the tasks of the ideological-indoctrinational function of the party and its struggle for the building of communism have become greatly complicated, this work cannot be conducted in the old manner. It is very important to consolidate and multiply everything new and advanced which has been accumulated in the work with propagandists and in the organization of the entire system for political education in the last training year. Analyzing its results profoundly and comprehensively, in the new training year lectures and seminars should be organized in accordance with the requirements of the CPSU Central Committee. In the decree, in particular, it is pointed out that party training still does not completely meet the requirements of life and the new tasks of communist construction and is not sufficiently tied to the accomplishment of urgent socio-political and production tasks. The increased general-educational and political level of the communists and their degree of information, spiritual demands, and professional interests are considered poorly. A lively exchange of opinions, creative discussions, and a profound analysis of urgent questions and acute problems which concern the students are often lacking on the lessons.

It should be said directly that in the Air Forces, too, there are still individual political organs and party organizations which devote insufficient attention to the comprehensive improvement of the training process, the selection of propagandists, and equipping them with the leading methodology for instruction and indoctrination. Military councils, commanders of all echelons and ranks, and political organs and party organizations of the Air Forces, being guided by the decisions of the party and the instructions of the Soviet Minister of Defense and the chief of the Main Political Directorate of the Soviet Army and Navy, are called upon to intensify the monitoring of the improvement of the Marxist-Leninist training of the officers and generals, the political instruction of warrant officers [praporshchik], the political lessons with the soldiers and noncommissioned officers, and the entire existing system of party instruction and economic education in the new training year.

A subject of constant concern of political organs and party organizations is a further rise in the scientific level of lessons and the strengthening of their tie with the life and combat training of the personnel. Therefore, in improving the Marxist-Leninist training of the officers, it is necessary to employ more widely on lessons the problem method of instruction which ensures the closer contact of theory with practical tasks. To intensify the ideological tempering of pilots, navigators, engineers and technicians, and officers of the supporting subunits there should be the more active use of theoretical and scientific-practical conferences, lecture bureaus, lecture cycles, interviews, political information sessions, and the discussion of papers as well as of the time allotted annually in the system of commanders' training for lessons on military pedagogy and psychology, the principles of military legislation, and the practice of political-indoctrinational work.



The framework for the employment of the problem method of instruction in the social science departments of Air Forces military educational institutions has now expanded, which furthers the deepening of the ideological-theoretical level and an increase in the flexibility of thought of officers and officer candidates. It is believed that in the new training year more attention should be devoted to theoretical and methodological seminars in the political training of the professor-instructor personnel and scientists who are studying Marxist-Leninist theory in accordance with individual plans. It should be seen that seminars become a genuine school for the political, philosophical, and economic training of these personnel and the basis of their ideological and theoretical growth.

Certain favorable experience has been accumulated in this regard in the Air Forces Red Banner and Order of Kutuzov Academy imeni Yu. A. Gagarin and in the Air Forces Engineering Orders of Lenin and October Revolution Red Banner Academy imeni Professor N. Ye. Zhukovskiy. Here a broad range of problems posed by the 26th CPSU Congress is studied on theoretical and methodological seminars. The lessons proceed in a lively manner and with a great ideological load. Each of them leaves a noticeable trace in the memory of the students.

The army-wide conference of leaders of military educational institutions of the Soviet Ministry of Defense which was conducted in September 1982 posed difficult and important tasks for the personnel of academies and schools. With their consideration, certain additions should be introduced in the training plans, naturally not exceeding the allotted program time.

In the new training year the academies and military schools of the Air Forces should reach a new, higher position in the training of personnel. And for this, it should be persistently seen that each officer candidate and student theoretically masters Marxist-Leninist theory, strives persistently to supplement and deepen his knowledge, possesses lofty moral qualities, and is a fighter against bourgeois ideology.

Unquestionably, the study of the Air Forces' combat traditions and their use for the patriotic indoctrination of the personnel using the best examples of our motherland's heroic past should also find a worthy place in political training. The combat traditions of the Air Forces should live in the consciousness and hearts of the sons and grandsons of veterans of the Great Patriotic War and should teach the aviators to love their country and, in case of necessity, to defend it just as skillfully and selflessly as the frontline fighters did.

It is necessary to improve in every possible way the basic method for the mastery of Marxist-Leninist theory--the method of independent work. Over a period of a number of years many officers of the Air Forces are occupied in accordance with personal long-range plans which are intended for the entire training year. The practice of the long-range planning of officers' independent work which has developed should find consolidation and further development in the new training year. Commanders and political officers, party activists, and leaders of Marxist-Leninist training groups are required to become interested systematically in the course of accomplishment of officers' personal long-range plans and to render them necessary assistance. The activity of Officers Houses, libraries, reference-information centers, classes in Marxist-Leninist education, and moral-political and psychological training should also be aimed at this.



The most important task of the universities of Marxism-Leninism and the two-year party schools is the training of officers for the successful accomplishment of propagandist duties in the political-training system.

This year, the quality of the lectures and seminars in groups for the political instruction of warrant officers and the career servicemen is to be raised persistently and purposefully. Political organs and party organizations are called upon to attain high effectiveness in their independent work on studying the recommended literature. It is desirable that papers, as a form which is inherent meanwhile in lessons on Marxist-Leninist training, also find worthy application in the political training of the warrant officers.

In organizing political lessons with soldiers and noncommissioned officers, it is necessary to consider more completely the increased general educational and cultural level as well as the demands of the audience and employ the lecture-seminar method as well as the narration-talk method creatively.

In the new training year, in the system of party education of officers, warrant officers, soldiers, and noncommissioned officers it is important to regard the organization of this work in the spirit of the requirements of the well-known decree of the CPSU Central Committee and the directives of the Soviet Minister of Defense and the chief of the Main Political Directorate of the Soviet Army and Navy with all responsibility. It is the duty of the military councils, commanders, political organs, and party organizations to steadily improve the leadership of political training and party instruction, accomplish the principled and effective monitoring of their organization, and constantly study leading experience and disseminate it widely. Each party organization should actually become a genuine center of daily ideological-indoctrinational activity and should actively influence the political training of the personnel of Air Forces units and subunits.

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## MOUNTAIN FLYING TRAINING FOR FIGHTER-BOMBER PILOTS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 83 (signed to press 3 Dec 82)  
pp 12-13

[Article by Gds Capt I. Silenok, 1st-class military navigator: "Flights in the Mountains"]

[Text] Fighter-bomber crews can now be involved in the accomplishment of the most varied missions, each of which has its own special features. Flights and combat employment in mountain and mountain-desert terrain pertain to one of these.

As is known, aircraft navigation in the mountains is complicated by the fact that it is impossible to emplace the necessary quantity of ground RTS [radiotechnical means] under these conditions. Moreover, their operating range is limited by mountain relief. Therefore, prior to accomplishment of assignments we make a thorough map study of the flight area. On them we highlight snowy peaks and typical summits which will be reference points in flight under simple weather conditions. We conduct visual orientation from typical ridges, mountain rivers, and populated places. We consider that, as a rule, populated places are located in valleys and, during flight somewhat to the side of them, they may be covered by dominant peaks and clouds. However, mountain ridges and canyons are always easily visible on the screen of the on-board radar; therefore, in such cases it is easier to orient using a radar.

Aircraft navigation is significantly eased for us by autonomous reckoning equipment of the NVU [navigation-computational device] type which is used more conveniently in the general Great Circle system when the direction of the principal Great Circle is selected along the IPM [flight departure point]-target axis. Such a method permits the crew constantly to know the location of the aircraft with sufficient accuracy.

Employment of the navigation-computation device by the phase-Great Circle method requires work with the system during flight over the PPM [run turning point]. However, in an extreme situation this is not always possible due to a shortage of time. One of the features which hinder aircraft navigation in the mountains is that irregularity in wind direction and velocity in the absence of Doppler indicators leads to significant errors in dead reckoning and requires the constant monitoring of these navigation values.

When attacking targets which are located in canyons or between mountains with steep slopes, the effectiveness of bombing is increased with the employment primarily of

optical sights. But this requires a decrease in altitude. Moreover, many canyons and valleys with steep slopes have bends and turns up to 90 degrees in individual cases. Therefore, prior to takeoff we calculate ahead of time the radii of the turns, required bank angles, and the points for going into a bank. This gives the navigator the opportunity to issue timely commands to the pilot concerning the approach to the turning point, entry into a bank, and direction of the turn, which reduces significantly the psychological tension when flying along a canyon.

On preliminary preparations, it is also desirable to study the vertical profile of the terrain on the route and in the target area from large-scale maps, after which one should calculate ahead of time the flight mode when entering the canyon and leaving it.

Experience shows that with flight through a canyon repeated target approaches are virtually impossible. Under such conditions, combat employment requires of the crews the maximum attention during target search and readiness for the instantaneous employment of means of destruction.

It should be considered that the target's altitude above sea level frequently may reach several kilometers. Here, the ballistics of aviation means of destruction change substantially. In these cases, we calculate sighting angles with consideration of the change in the bomb's characteristic time of fall which we determine from the Vetchinkin formula:

$$\Theta = 20202 + (\Theta' - 20202) \frac{20 + \Delta H}{20 + \Delta H'}$$

where  $\Theta'$  -- the bomb's characteristic time of fall under standard conditions;  
 $\Delta H$  -- the target's altitude above sea level.

With flight above relief below 600 meters, it is best to read the bombing altitude from a low-altitude radio altimeter. When it is necessary to bomb from great altitudes, prior to takeoff one should highlight on the maps the absolute altitudes of the terrain in the areas of probable target disposition. From these data and the airfield's altitude difference, we calculate corrections for relief:

$$\Delta H_r = H_{a.t} - H_{a.a}$$

where  $H_{a.t}$  -- the absolute altitude of the terrain;  
 $H_{a.a}$  -- the absolute altitude of the airfield.

Then we plot them on the map in the target area.

The work which has been done provides the opportunity to determine the true flight altitude quickly, taking readings of a barometric altimeter set according to the atmospheric pressure at the airfield of takeoff:

$$H_t = H_{\text{airfield}} - \Delta H_r.$$

Constantly knowing the necessary sighting angle, the pilot has the capability to accomplish the bombing in good time.

Flight to the home airfield from mountain regions located outside the zone of action of ground radars is accomplished using the autonomous reckoning system, on-board radar, visual orientation, and dead reckoning. When conducting visual orientation, one should not forget about unstable weather in the mountains. In a short time, the mountains may be covered by clouds and their outlines change. Therefore, after entry into the zone of action of ground radiotechnical means the location of the aircraft should be adjusted. Further flight with arrival at the airport of landing is accomplished using the aircraft radio-compass and radio navigation system of local air navigation.

Experience shows that it is necessary for crews which fly in mountainous terrain to possess lofty moral-volitional qualities and to be constantly ready for the accomplishment of an assignment with partially inoperable navigation equipment, the absence of control from the ground, and sudden weather changes. One should constantly instill these qualities in oneself both on the ground and in the air. The degree of combat readiness of each crew depends on them to a great extent.

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## ACTIVITIES OF PARTY COMMITTEE WORKERS IN FIGHTER BOMBER UNIT

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pp 14-15

[Article by Maj N. Antonov: "Within the Competence of the Party Committee"]

[Text] Election meetings have taken place in the party organizations of the Air Forces. The results of socialist competition were evaluated on them and attention was concentrated on unresolved problems and unused reserves and opportunities. The reports and elections showed that the strength of party influence on all aspects of combat training is higher where the communists have good knowledge of its status and constantly instill in the personnel lofty professional, moral-political, and skill qualities.

The initiative work of the party organization is characterized first of all by dissatisfaction with what has been attained and the search for ways for the high-quality accomplishment of the assigned tasks. Such an atmosphere reigns in the aviation regiment where Major A. Lebedev is the secretary of the party committee.

The gray shroud of clouds densely covered the sky to the very horizon. A sudden wind ripped yellow leaves which had still survived from the trees in places and a curtain of snow rose.

"Well, Aleksey Ivanovich, you didn't expect such a 'special situation'?" the secretary of the regimental party committee, Major A. Lebedev, turned to the deputy squadron commander for political affairs, Major A. Fabrom.

"To tell the truth, yes, Aleksandr Vasil'yevich, we did not expect snow. And nevertheless, the results of the work on the range are not half bad," the political officer replied.

The best trained pilots were the first to take off on combat employment. The snow which had fallen at night changed the terrain relief and hindered orientation. It became even more difficult to find little-noticeable targets. And it was right here that the high skill of the aerial fighters was disclosed in full measure. Among the copses, openings, and gullies which appeared for a moment beneath the wing, they discovered the "enemy" from barely noticeable signs and launched an accurate

strike against him. As always, communist-leaders V. Loemaa and A. Fabryy and other experienced aviators coped with the mission excellently.

In the control tower Major Lebedev met them and asked them to tell their fellow servicemen about their actions on the difficult flight route to the range and during bombing and firing.

"Now your words and your experience are especially necessary, comrades," said Aleksandr Vasil'yevich. "A fighting spirit and the heat of rivalry in today's competition depend on this to a great extent."

The vanguard role of the communists was clearly shown from the very first hours of the tactical flying exercise. Thus, first class military pilot Captain A. Kochetkov and a young aerial fighter, Lieutenant M. Kononykhin, accomplished all assigned missions masterfully. The aviation equipment of officers of technical service A. Koshevoy and A. Bakhvalov was always in a combat status. The flight commanded by first class military pilot Captain V. Afanas'yev, secretary of the squadron party organization, firmly retained the leadership in socialist competition. The example of the leaders possessed great moral and organizational force which was directed toward the successful accomplishment of the assigned missions. The aviators strived to send each bomb and each shell to the target accurately and competed in piloting technique, speed of target detection, and the accuracy of target destruction.

The next fighter-bomber taxied out to the hardstand. In flight, Senior Lieutenant A. Andryushchenko operated skillfully: he found the target in good time and hit it accurately. The flight leader already knew of this. Captain Afanas'yev immediately compared the results of Andryushchenko's sortie with that of his rival in the competition. They proved to be almost identical. The flight recorder data decided everything. They showed the slightest inaccuracies in the piloting technique committed by the pilots. Andryushchenko moved ahead of his comrade at the given stage of flight for number of points. The party activists immediately informed all aviators about this.

On the eve of the LTU [tactical flying exercise], in briefing members of the party bureau, party group organizers, and agitators Captain Afanas'yev called their attention to the complexity of the conditions under which it would be necessary to accomplish the training-combat missions and he called for the rapid generalization and dissemination of the leaders' experience and the timely prevention of miscalculations.

As the tactical flying exercise picked up tempo party political work also expanded. Party activists officers V. Afanas'yev, Yu. Shigin, and others conducted short talks with the aviators about the necessity to maintain high vigilance and discipline, acquainted them with the latest events in the country and abroad, published photo bulletins devoted to the leaders in the competition, pilots Senior Lieutenants F. Gareyev and A. Andryushchenko, and generalized the work experience of the best specialists of the IAS [Air Force Engineer Service] who are ensuring the rapid change of the types of armament. Great assistance in the organization of this work was given by Major Lebedev and party committee members officers B. Strel'tsov, A. Parchuk, and N. Shchetinin.

On that day, the secretary of the party committee could be seen everywhere: in the control tower, on the hardstand, in the service groups. Aleksandr Vasil'yevich did not simply record the successes and shortcomings of people, but he helped them on the spot with word and deed.

Major Lebedev turned attention to the work of the flight leader, Captain A. Kochetkov. On such important flights this communist-leader successfully combined command duties with public ones. Using the slightest break between sorties, Kochetkov met with party and Komsomol activists, assigned them clear and specific tasks, and advised them whom to help first, whom to praise, and whom to lecture. And the results had their effect on matters here: any success or blunder became immediately known to all personnel--it was reflected in the materials for graphic agitation or was noted in talks. From this the aviators drew the appropriate conclusions to build up success in the air and on the ground. In other words, the commander set a good and businesslike tone and was an example of self-collection, organization, and activity. It is not by chance that the flight coped successfully with the assigned mission.

On that same day, on the initiative of Major Lebedev the experience of Captain Kochetkov's work with the party and Komsomol activists which was directed toward the organization of socialist competition was disseminated in all squadrons. The unit party committee recommended to the flight commanders, especially to the young ones of which, by the way, there are many in the regiment, that they use it in their activity.

During the tactical flying exercise the secretary of the party committee noticed something else. The squadron activists, it appeared, had done much and put out special bulletins, operational news sheets, and combat leaflets on the results of the competition. But becoming familiar with them, Aleksandr Vasil'yevich noted that some materials have a general, nonspecific nature and do not inform the aviators much about the details and essence of leading experience. This served as the subject of a short talk with the squadron commander and political officer and the secretary of the party bureau. The communist-leaders agreed with the opinion of the party committee secretary and subsequently began to turn attention not only to the operational nature of information, but first of all, to its content and practical use.

In summing up the results of the exercises, the regimental commander noted the increased professional skill, combat maturity, and lofty moral-psychological tempering of the aviators which was furthered to a great extent by effective party-political work and the ability of the party committee to mobilize the efforts of the communists for the accomplishment of the main tasks.

It is believed that there is no need to say that the work style of the party committee secretary is divined in this in some measure. Major Lebedev firmly follows the recommendations of the 6th Army-Wide Conference of Secretaries of Primary Party Organizations that each party organization, bureau, and party committee must have a deeper knowledge of the state of affairs on the most important sectors of the combat training and life of the troop collectives. He tries to use these recommendations in daily work with people.

There was a time when the personnel of the squadron commanded by Major V. Loemaa relaxed the efforts somewhat in combat and political training and socialist

competition. This was reflected in the results of the accomplishment of flight missions by individual pilots on one of the tactical flying exercises. The subunit received a low grade.

Naturally, the party committee could not ignore this. Consulting with the commander, Major Lebedev studied in detail the state of affairs in the squadron, talked with communist-leaders, party activists, pilots, technicians, and mechanics, and visited party meetings and bureau sessions. The facts showed that the squadron communists forgot about their vanguard role in combat training and reduced noticeably their influence on the organization of socialist competition. The party committee outlined specific measures to eliminate the situation which had been created. The command approved them.

In particular, it was recommended to member of the flight section of the unit methodological council, communist N. Bocharov, that he make a deeper study of the procedure for the instruction and indoctrination of the squadron's pilots, analyze typical errors, and help the commander in their elimination. At the same time, the party committee conducted a seminar of party group organizers at which party activists having great experience in working with people spoke. They told in detail about the organization of socialist competition in their subunits and about how high responsibility for the assigned matter is instilled in the collective.

After the seminar, officer Loemaa approached the secretary of the party committee.

"The talk turned out well, businesslike. I think, Aleksandr Vasil'yevich, we have something to learn from others. Well, and thanks for the help! We will pull ourselves up for our part."

Running ahead, I will say that the squadron commander kept his word. Relying on the assistance of the party activists and of all the communists in the subunit, he managed to lead the squadron out of a difficult position. Now, things are not half bad there. But nevertheless, the speeches of communists at the unit's party election meeting are automatically recalled; in them concern was heard about the fact that as yet not everything has been done in the collective for the subunit to join the leaders and that there are still many undisclosed reserves and unused opportunities.

However, let us return to the question of raising the effectiveness of the competition. The party committee did much work, first of all its secretary, in order to make competition more active in the squadron.

On one of the sessions of the party committee with the participation of the subunit leaders, Major Lebedev proposed that in evaluating the results of the competition between pilots by tasks and standards there should be a more objective use of the data from monitoring and recording equipment for a more detailed analysis of the quality of accomplishment of flights for combat employment. Publicity and its specific nature immediately gave the competition sharpness. Thus, long-time rivals in the competition, officers A. Ryazanov and G. Mukhametov, were often mentioned among the best pilots of the subunit. But at times, in their competition there was an absence of motivation which stimulates one to action. Both clearly accomplished all elements of the flight, and conformed to the standard for an excellent grade in



firing and bombing. But an analysis of the recorder equipment, for example, permitted seeing the slightest inaccuracies in maintaining speed and altitude and the loss of aiming time connected with this. As a result, in determining the victor of the competition they began to consider not only the final result, but also the clearness in the accomplishment of each flight element. This stimulated the aerial fighters to initiate more widely the competition for high quality in working out each exercise.

In speaking about the work of the party committee secretary, we cannot fail to mention one more fact. By the way, it was also discussed at the party election meeting. Lebedev learned that the chief of the service group, Captain of Technical Service N. Abramskiy, is maintaining a journal of socialist competition where, in addition to notes on the aviators' individual obligations, there is a detailed analysis of the dynamics of their accomplishment. Meeting with the officer, the party worker inspected this journal, approved it, and expressed the desire that the characteristics of people and their attitude toward service be considered there. Major Lebedev proposed to the communist-leaders of the squadron and the party bureau that they spread this experience, and now each commander and chief has such journals. In certain measure, this furthered intensification of the heat of competition for the title of best pilot, technician, or mechanic and best group and flight.

The party committee sees an important condition for raising the responsibility of the aviators for a growth in professional skill in the constant, strict monitoring of the accomplishment of outlined plans and decisions as well as of the realization of critical remarks and suggestions expressed by communists at the party election meeting which took place recently.

In the new training year the communists and all personnel of the air regiment, actively supporting the initiative of the initiators of socialist competition in the Air Forces, are giving all their strength to the high-quality mastery of combat equipment, improving flight safety, and strengthening organization and discipline. And the members of the newly elected party committee, headed by the secretary, Major A. Lebedev, are actively helping the command in the accomplishment of the missions facing the regiment.

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## IMPORTANCE OF WEATHER RECONNAISSANCE FOR FLIGHT DECISIONS

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p 16

[Article by Engr-Col D. Finogeyev and Engr Col (Res) V. Mitrofanov: "Weather Reconnaissance and the Decision for Flights"]

[Text] Officer V. Neuchev took off on weather reconnaissance and discovered a thick zone of cloud cover within 15 kilometers of the airfield. Snow showers limited visibility to two kilometers. The cloud mass quickly advanced on the airfield. On command of the flight operations officer the pilot stopped accomplishment of the assignment. However, he had to execute the landing at the limit of the weather minimum.

In releasing the aircraft, why didn't the responsible personnel consider the radar weather reconnaissance data? With the discovery of blips from the cloud cover, the specialists did not estimate their intensity and, therefore, did not determine the possibility of precipitation falling. The chain stretched farther. Receiving incomplete synoptic data the flight operations officer, duty weather forecaster, and weather scout did not delve into their essence and, as a result, made a superficial analysis of the weather situation in the area of the airfield and of forthcoming flights. But you see, they should have been alerted by the fact that in these regions in the winter period blips on the scopes of authorized airfield radars always testify to the great vertical thickness of cloud cover and the probability of precipitation.

As is known, flight safety greatly depends on the quality of weather information, the conformance of weather conditions to the nature of the flight assignments being accomplished, and to the level of training of the flight personnel. The determination of this conformance and decisions for flights are taken as the basis for estimates of the actual weather condition and its forecast for the period of the flight shift.

In determining actual weather conditions and working out the forecast, weather reconnaissance serves as one of the basic sources of information. In contrast to other means, it provides more complete and reliable information on takeoff and landing conditions, the distribution of cloud layers, and the presence of dangerous weather phenomena--icing, buffeting, electrification, wind shear, cumulonimbus cloud cover, and thunderstorms, hail, cloudbursts, and squalls.

It should be noted that in comparison with other means for obtaining necessary weather information aerial reconnaissance is the most effective and provides the best results. Let us say that radar weather reconnaissance does not permit the discovery of zones of fog and low cloud cover whose vertical thickness is small. If such sectors do not fall in the field of view of weather stations, it is virtually impossible to determine their existence by other means. Therefore, there are frequent cases where the cloud cover unexpectedly drops on an airfield and visibility deteriorates during the conduct of weather reconnaissance. This is especially dangerous if it is accomplished with the established weather minimum.

In one of the bomber units, in the forecast for weather reconnaissance which was worked out by Captain of Technical Service N. Yezhkov a 10-point cloud cover with the altitude of the lower limit 150-200 meters, haze, and brief snow with visibility of 2-3 kilometers were expected. It was decided to conduct aerial weather reconnaissance. Fifteen minutes after the scout took off the landing course was closed by fog. The crew was dispatched to an alternate airfield. In this situation, this was the only correct decision.

It happens that weather conditions deteriorate unnoticed by the crew of the reconnaissance aircraft. In such circumstances, the pilot has a special need for firm skills in evaluating the weather in flight. Otherwise, the danger increases on a descent beneath the clouds below a safe altitude or on a landing under conditions lower than the minimum. In order to avoid this, when conducting aerial weather reconnaissance it is necessary to consider the following special features.

Prior to making the decision for reconnaissance, in addition to regular measures there should be a thorough analysis of the conditions on the landing. For this, landing visibility is calculated using a graph presented in the methodological aid "Organizatsiya i vedeniye razvedki pogody i ornitologicheskoy obstanovki" [Organization and Conduct of Weather Reconnaissance and the Ornithological Situation] (Voyenizdat, 1981, p 57). Horizontal visibility at the ground and the averaged altitude of the lower cloud limit measured above the long-range homing marker beacon and the close-in homing beacon serve as initial data for calculations. It is also recommended that the forecast of the altitude of the lower cloud limit for the period of weather reconnaissance be refined using computational methods.

The decision for aerial reconnaissance is adopted in the case where the determined landing visibility and the forecast values of cloud altitude and visibility correspond to the established minimum.

It is recommended that weather reconnaissance be conducted in two stages. On the first stage the scout determines the zones of low cloud cover and limited visibility in the direction from which the air mass is transferred in the ground layer. The flight is accomplished beneath the clouds at an average distance of 40 kilometers. The crew evaluates conditions for takeoff, the landing approach, flight in the clouds, the presence of zones with cloud altitude and visibility below the established minimum, their location, and the direction and rate of movement in the area of the airfield.

The decision for the conduct of the second stage is taken only in the case where weather conditions in the area of the airfield which have been determined on the

first stage are not lower than the weather minimum established for a given flight shift and their worsening is not expected.

The mission of weather reconnaissance on the second stage is refining the weather conditions in the area (on the route) of forthcoming flights and in directions from which their change is possible. In evaluating the weather data which have been obtained, special attention is paid to the presence of dangerous phenomena in the clouds, the distribution of the cloud cover, and piloting conditions at the altitudes of forthcoming flights.

The correct organization of additional weather reconnaissance has great significance for reliably ensuring flight safety with the minimum. Here is one example.

A warm front approached on of the long-range aviation airfields from the west. According to the data of preflight weather reconnaissance, the altitude of the lower limit of cloud cover in the zone of the airfield was 180-200 meters with a visibility of 2 meters. The forecast for flights worked out by Major Poluektov indicated 10-point cloud cover with the lower edge of 150-200 meters and haze with visibility of 1.5-2 kilometers. At the end of the period a lowering of the cloud cover to 150-100 meters and a deterioration of visibility to 1-1.5 kilometers were expected.

The only correct decision was made in this case: to accomplish the flights with the minimum with the simultaneous conduct of additional weather reconnaissance. The flight operations officer, Lieutenant Colonel S. Zubov, assigned the crew the mission to determine the limit of cloud cover with an altitude less than 150 meters in the western direction and to execute flights along it, which permitted continuously monitoring the approach of cloud cover to the airfield and landing the crew in time.

Flight safety and accomplishment of the plan for instructional-combat training on a flight shift depend to a great extent on the clear organization and conduct of weather reconnaissance and additional reconnaissance. A thorough analysis of weather conditions prior to flights and the forecasting of the weather with consideration of special local features are the guarantee of the airfield's rhythmic operation and a reliable barrier to preconditions for flying accidents through the fault of the weather specialists.

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## PROBLEMS IN TRAINING AIRCRAFT COMMANDERS DISCUSSED

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pp 20-21

[Article by Maj Gen Avn S. Lartsev, honored military pilot of the USSR; "Ahead of Time, with Prospects"]

[Text] In the system of combat and political training of long-range aviation flight personnel, questions of training aircraft and detachment commanders occupy a special place. To all intents and purposes, the professional competence of officer-aviators is constantly growing. They are armed with good theoretical knowledge and possess high capacity for work. But frequently, they lack developed command skills, which affects their service activity in one way or another, especially the indoctrination of subordinates.

The aircraft commander is a special post. Controlling an aircraft which is carrying weapons of great destructive force, he is also completely responsible for the accomplishment of the combat mission and for the lives of the crew members. Regardless of age and length of service, the commander does not have the right to know less than his subordinates. Moreover, he is answerable for the training of the crew members and their conduct in service and in daily life. In this connection, the commander of an aircraft should be an example for his subordinates in everything and should possess favorable character features and lofty moral-political and professional qualities.

Unfortunately, not all aircraft commanders fully possess the qualities necessary for the aerial fighter and teacher. There are many objective as well as subjective reasons here. The main thing, in our view, is that it is extremely difficult to bring the level of training of aircraft commanders into conformance with the posts which they occupy in compressed times. Difficult, but fully possible. For this, aircraft commander days are conducted in the units. It should be said that such days were also practiced earlier. However, due to the absence of an orderly instruction procedure and purposefulness of the lessons their effectiveness was comparatively low. In addition, sight was lost of the fact that the personality is molded in its contact with people, which is a long and difficult process.

These shortcomings are now being overcome. And success is found where, in the organization of aircraft commander's day, the senior commanders remember that this measure is an important means for training and indoctrinating officers which

supplements the procedure which has taken shape. Such days should not substitute for commanders' training; however, it is not excluded that individual questions on its subjects, especially those which are difficult and long-term, will be raised. For example, the study of the international situation and some problems of the country's domestic life naturally supplements Marxist-Leninist training.

For aircraft commander's day to bring the maximum value, it is very important to select effective procedures and methods for the conduct of the lessons and to interest the students in the novelty of knowledge. To all intents and purposes, the organizers of the lessons should be convinced themselves, first of all, that such days are needed and should transmit their conviction to their subordinates. In this regard, officers G. Treznyuk, V. Selivanov, V. Tolcheyev, A. Bessmoly, and others provide a good example.

As experience shows, on the eve of lessons with future teachers it is useful for the regimental commander to conduct a fundamental talk concerning the significance of commander's day and to assign tasks. The effectiveness and return from such measures for this special purpose will depend on how correctly the officers understand the necessity for them. Therefore, on the lessons which discuss fundamentals it is necessary to set forth the essence of the problem in a well-reasoned manner and convincingly.

It is necessary for the lesson leaders to present examples from life and to use graphic aids. It is very important to consider the general educational level of the students. Truisms should not be repeated since this inevitably dooms the lessons to failure. A verbose lecture isolated from vital problems dampens the ardor of the students: they only wait for it to end. There is much more value from a short, dynamic lecture which is tied to the life and service of the military collective and to the needs and interests of people. The combination of strictness in the presentation of a subject with a good joke, which permits lifting excessive tension from time to time, is completely permissible. Talks with a free exchange of opinions are also extremely useful.

Great possibilities are contained in the combination of these two forms for the conduct of lessons. The lesson leader should not fear controversial questions. On the contrary, he should encourage the initiative of the students and skillfully direct the conversation to the search for the truth. It should be seen that in discussing some specific example, each officer looks for the correct solution to the problem, expresses what he thinks, and does not adjust his answer to the generally accepted opinion.

Seminars should also be free. If a person thinks only of the grade he will receive and worries only about the effect of his future presentation, it can be said with confidence that nothing worthwhile will come of this. When discussing questions of international policy, it is more expedient first to listen to papers which the students have prepared on this subject or to a comprehensive report. Then in an unconstrained talk, using interesting and instructive facts, to discuss the situation from the viewpoint of dialectical materialism, calling special attention to the aggressive, misanthropic essence of imperialism.

Through the fault of the United States' ruling circles, the world is now under the threat of an explosion of war. In studying the combat equipment and tactics of foreign armies, special attention should be paid to their strong and weak aspects so as to be ready at any moment, if the situation requires, to enter into a fight with a specific rather than an abstract enemy. That is, as V. I. Lenin said, "one should know his enemy and should be able to fight with him."

On lessons, various questions of the personnel often arise which the senior commanders must answer. And here it is necessary to show how and who should resolve various problems depending on legal responsibilities and competence. Otherwise, you see, people frequently go to the squadron or regimental commander on all sore subjects without thinking that they can be completely solved with the immediate commanders. By the way, individual commanders and their deputies solicit senior commanders on one question or another although they have the right to do everything themselves. And at times they do not think that by such actions they undermine their own authority. A sense of responsibility for the assigned matter and resoluteness and persistence in the attainment of the assigned goal should be instilled in each officer. In other words, each serviceman should use the rights and obligations determined for him by Soviet laws and military regulations completely.

In the training and indoctrination of aircraft commanders, it is very important to instill in them a love for their work and pride in the combat profession. Romantic enthusiasm--this is only the beginning, even if a good one. However, the formation of a pilot or navigator occurs subsequently. Profound knowledge of aviation equipment, skill in piloting and combat employment and, of course, high consciousness and ideological conviction are acquired by persistent labor. Here, there can be no place for bragging and arrogance which, it must be owned, are frequently peculiar to the youth at first. But you see, the sky, as is known, does not like braggarts and punishes them very severely for errors.

It happens that because of certain reasons uncertainty and even timidity when facing new, difficult types of professional training appear in the pilot. Usually, in such cases they say that the person had flown himself out and there is nothing to expect from him but preconditions for accidents. He is dropped from flying work. In general, this is a natural even if rare phenomenon. It is another matter when a person calmly leaves the flying profession; leaving on a pension or for ground work, he does not regret that he will never again climb into the sky. And why? It is far from a simple matter. There is something to think over here. One thing is clear: we should bring up people who would be infinitely devoted to flying and who are not so simply knocked off the track because they have the main incentive in life--flights. Officer S. Kovalenko, an experienced pilot and wearer of the orders "For Service to the Motherland in the Soviet Armed Forces" 2d and 3d degrees, always speaks of them ardently and with inspiration. A skillful teacher and participant in many exercises in various regions of the country, he tells convincingly and with genuine passion and love about the flights and actions of the crews in various situations. There is something to learn from him, and the aviation collective is proud of him.

An important place in the training of aircraft commanders is occupied by instilling in them demandingness and irreconcilability toward shortcomings and the requirement to be concerned about subordinates and display sensitivity toward them.

Demandingness and sincere kindness do not contradict each other in the least, as some commanders assume at times. Genuine, just, military demandingness is also concern for people, for their well-being, and condescension and an all-forgiving nature often cost very dearly. Thus, officer V. Laponogov, knowing about the shortcomings in the work of aircraft commander V. Lavrent'yev, did not demand their timely elimination. In the end, this led to serious consequences.

In training aircraft commanders, one must instill a high style in them and cultivate socialist morals. Here, as facts show, all is not well everywhere. If commanders influence the behavior of the men in service and in public places within the framework of the regulations, they pay little attention to their personal life. The style of speech of individual comrades, let us say directly, leaves much to be desired. And the ability to express one's thoughts precisely and the clarity of command language are not a secondary matter. It is completely clear that each officer should expand his horizons persistently and become interested in literature and art. It has been noted that the more a person becomes interested in various aspects of cultural life, the higher also is his military knowledge. A certain regular law is present here: an inquisitive person, of course, also has a broader range of interests, including in the field of military knowledge (contemporary Soviet and foreign equipment, the experience of combat operations, military history).

And, of course, each aviator should be engaged in physical culture. This is not a tribute to fashion, but a means for increasing his flying longevity. Physical hardness, high fitness for work, endurance, speed of reaction--these qualities have permanent significance for the aircraft commander. This is constantly remembered by officer-leaders V. Shelyug, V. Fatnev, and L. Saykovskiy who systematically organize lessons in physical training with consideration of forthcoming missions. Here, they devote great attention to instilling boldness, will, and persistence in the aviators using special sports equipment (vertical swing, safety nets, horse) and parachute jumps.

During the conduct of aircraft commander's day, great value in the molding of the officer's personality is brought by talks about honor and truthfulness. In aviation honesty and truthfulness, frankness of opinion, and candidness in admitting one's mistakes help to struggle against miscalculations and preconditions for accidents. Lying and deceit often led to serious consequences. Therefore, they should be suppressed decisively and punishment for them should be much stricter. Of course, each misdemeanor should be evaluated correctly, but the punishment should not influence the frankness of admission. It is very poor when some commanders dress people down for any cause and "dispense" punishment right and left. This only shows the inability to work with people, poor pedagogical training, or even simply ill breeding.

On lessons with aircraft commanders, it is necessary to solve problems on quickness of wit so that the officers learn to shift their attention quickly from one subject to another, answer unexpected questions, and adopt correct decisions efficiently. This, as practice shows, removes excess tension and develops flexibility and speed of thinking, self-criticism and self-analysis, creativity, and initiative. Knowledge by heart and automatism are good during operations in special situations, but only when they are typical.



It is very important for aircraft commanders to instill in themselves accuracy, punctuality, and consistency in everything and, I would say, pedantry to a certain degree. The latter is much better than disorganization and confusion in thoughts and deeds. One should learn to formulate his thoughts clearly, speak laconically and clearly, and make the most of his own and others' time. It is necessary to be able to plan one's work. Aircraft commanders officers V. Cherkashin and Yu. Ageyev can be presented as an example. They do not conceive of their work without a clear plan for the day. And it is not by chance that they always succeed in doing everything in the planned time. A smart military bearing and exemplary outer appearance--these are indicators of the commander's style. It is necessary to achieve a situation where neatness, courtesy and correctness become the internal requirement of each officer.

Practice shows that the effectiveness of aircraft commander's day is higher the more purposefully indoctrination work with assistants and their selection for the post of aircraft commander are conducted. Persistent work on deepening their military and special knowledge is a unique visiting card for advancement. On the whole, all these measures are called upon to raise the combat activity of the main category of long-range aviation flight personnel and to intensify the striving constantly to raise professional skill and readiness to accomplish their patriotic and international duty on the call of the motherland at any moment.

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## FAMILIARIZATION WITH EJECTION SEAT STRESSED

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pp 22-23

[Article by Maj Med Serv A. Kozlovskiy, candidate of medical sciences: "It was Necessary to Abandon the Aircraft..."]

[Text] The technical perfection and reliability of ejection seats cause no doubts. However, for the pilot to be absolutely confident of their faultless operation, he first should know them well, assume the preparatory posture in the seat quickly and correctly, and activate the firing mechanism. Naturally, prior to flight the psychological preparation of the pilot is directed toward accomplishing the assigned mission and not toward the possibility of a situation arising in which it is necessary to abandon the aircraft. But nevertheless, it should be remembered that firm skills in working with an ejection system, which have been made automatic, are the guarantee of abandoning the aircraft safely in an emergency situation which has suddenly arisen.

Contemporary ejection seats are complex automatic devices with electronic equipment. They permit saving the pilot at zero altitude and zero velocity. Their reliability is provided by the optimum selection of the impact overload provided by the firing mechanism, improvement of the binding system, and the device for clamping the feet and arm-spreading limiters. Increased safety is provided by means for protection against the effect of an air flow which also includes individual protection equipment: protective helmet or pressure helmet, oxygen mask, pressurized suit, and others as well as systems for reflecting the flow which are installed on the seat.

Unquestionably, the correct use of these and other devices depends on the abilities of the pilots and their strict observance of instructions which are in effect. What typical errors are committed? First of all, the incorrect preparatory posture for ejection and poor adjustment of the binding system and individual equipment.

Not to assume the preparatory pose means increasing sharply the loads which act on the human body with the triggering of the firing mechanism and landing in an air flow. Ejection is accompanied by the action of overloads in the head-pelvis direction. The inertial forces which arise here lead to the appearance of mechanical stresses in the human body. They are expressed most typically in the backbone--the supporting part of the skeleton.

In the posture with the torso pressed against the back of the seat, the impact loads on the backbone are distributed uniformly in the cross section of individual vertebrae. An incorrect posture causes "fringe" stresses at places of non-physiological bendings of the backbone, and then all loads are concentrated on a narrow section of the vertebrae which come in contact with the surfaces of the body. The possibility of serious injury increases. Poor adjustment of the binding system, in particular of the shoulder and belt straps, may lead to this. Resistance to the effect of external loads is increased by a so-called grouping--the preliminary straining of the trunk muscles.

If the disruption of the posture does not lead to serious injury at the moment of ejection, the danger on subsequent stages of ejection is increased. The effect of the airflow on the pilot with poor clamping in the seat and inclinations of the trunk is much more strongly manifested.

The probability of injury to the head, face, and neck increases with the poor adjustment of the protective helmet or oxygen mask. This must be remembered.

During the abandonment of an aircraft in an emergency, pilot Mitrofanov committed only one violation and received an injury to his backbone. After the command of the flight operations officer, he prepared for ejection in 15 seconds. With such a margin of time Mitrofanov had the opportunity to accomplish all necessary actions. According to him, he assumed the posture for ejection. However, prior to turning on the firing mechanism he pressed against the back of the seat incorrectly--he did not shift back on the seat. As a result a space remained between the lumbosacral region and the back of the seat, and the backbone had a curvature opposite to the physiological curvature, with which the forward edges of the corpus vertebrae proved to be converged. The impact overload also led to the concentration of stresses namely in this region.

If the shoulder straps are not correctly adjusted, then after the triggering of their forced tightening slack remains which permits the pilot's torso to shift forward and to the side. With the action of the ejection overload a sharp "nod" forward and to the side arises. In this case, the loads are concentrated along the antero-lateral surfaces of the vertebrae of the thoracic section and a fracture is completely possible.

Pilot Sil'vestrov adapted an additional cushion on the seat of the chair which was not envisioned by the instructions for its use. Finding himself in an emergency situation, he accomplished all operations correctly. The binding system and the clamping were well adjusted. The pilot also assumed the preparatory posture. However, at the moment of ejection he felt a sharp pain in the back, held his breath from the surprise, cold sweat broke out on his brow, and bright spots flashed before his eyes. As was later learned, an expressed dynamic reaction arose with an increase in the overload on the pilot's body relative to the seat. The soft cushion only about 30 millimeters thick became the cause of the injury.

Under the influence of the impulse from the firing mechanism, the seat is subjected to the effect of an impact force with a certain rate of increase, in accordance with which its value on the initial section of movement also increases. The absence of a rigid "seat-pilot" connection led to an increase in the overload, since

at the moment of complete compression of the cushion the seat already had considerable velocity, and the pilot's body remained stationary. Figuratively speaking, one can say that the seat struck the pilot. If there had been no cushion, the seat and pilot would have moved simultaneously with the preservation of the rate of increase of the overload on the body and on the seat. The cases examined were long ago. After medical treatment the pilots continued to fly. But it is important to stress that the injuries did not have to occur.

The necessity to prevent injury to the backbone causes no doubt. However, it is no less important to disclose injuries which are not always accompanied by sensations of pain immediately after ejection. Complications which hinder the continuation of flying work may arise later. After ejection, it is mandatory to undergo a medical examination so that measures are adopted in time.

Great significance in the development of resistance to ejection overloads and the effect of the air flow is had by the physical training of the pilot which permits him to withstand the forces of the inertial displacement of the trunk and extremities through muscle tension. In addition, it is known that in sportsmen the bony tissue is restructured with an increase in its density and strength. It has been established that basically injuries during ejection arise in pilots with indices of density of the bony tissue lower than the mean values. Naturally, only active physical training permits increasing the density of the bones and, consequently, resistance to overloads during ejection. Since the initial feature to increase density consists of mechanical stresses in the bony tissue, running and exercises with jumps can be recommended for training. Pressure in the intervertebral disks can be increased with bendings of the torso, especially with dumbbells or a bar.

Training ejections on simulators play an important role. The pilot works out the skills and is convinced of the significance of the correct use of the binding system and adoption of the preparatory posture to soften the effect of the overload despite its lower value in comparison with the real one. In addition, regular lessons on the simulators are a kind of physical training which strengthens the backbone.

Firm knowledge and working out the skills in employing equipment for the emergency abandonment of an aircraft, strict observance of the instructions on adopting the preparatory posture, the correct adjustment of the system for clamping in the seat and the protective equipment, physical training, and training ejections permit raising the individual safety of the pilot and flight safety as a whole.

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## SERVICING HELICOPTER ENGINES DISCUSSED

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p 30

[Article by Maj Tech Serv V. Fefelov, deputy squadron commander for Air Force Engineer Service: "Care of Engines"]

[Text] Questions of ensuring long-term faultless operation of helicopter power plants were discussed at one of the technical conferences which took place in our unit. Officers V. Suponitskiy, V. Galan, and V. Karpov analyzed the experience of the leading technicians and mechanics. In particular, of Senior Lieutenants of Technical Service V. Gavriluk, A. Shkret, and N. Yel'kin who achieved high results in the last training year in the competition in honor of the 60th anniversary of the formation of the USSR. Those who spoke at the conference told about the special features in the operation of the engine's systems under winter conditions and gave a number of recommendations on servicing them.

We devote special attention to problems in preserving assemblies, units, and systems as a whole and prolonging the periods of equipment service. The personnel of the Air Force Engineer Service of our squadron, just as of other subunits of the unit, must do much work to overcome shortcomings and work out reliable preventive measures which are directed against the premature removal of power plants from helicopters. Aviators are seeking reserves to increase the reliability of rotary wing aircraft and are borrowing leading work procedures and methods to mark even the first months of the new training year with high successes.

Just as formerly, we are persistently instilling in each aircraft technician and mechanic personal responsibility for the accomplishment of work on the power plant. The chiefs of the TECh [technical maintenance unit] of flights and groups, considering the special features of winter operation, require that the specialists inspect the systems especially attentively and punctually, conduct instrument monitoring, and train subordinates to work in strict conformance with guidance documents and not to divide operations into primary and secondary.

"Did you measure the rundown time of the turbocompressor rotor yesterday? What were the parameters?" the chief of the flight TECh, Senior Lieutenant of Technical Service V. Bazarnyy, asks the technicians.

In analyzing these data and comparing them with the results obtained the experienced specialist helps the technicians to determine the condition of the rotor shaft bearings, which cannot be done visually. Officer Bazarnyy teaches them to discover from indirect signs whether the lubricant has congealed and whether the construction has been damaged by ice pellets. He personally checks the integrity of the filter elements of the lubrication system.

The chief of the flight TECh not only checks the filters, but in so doing he also shows the young specialists how to discover the deposition of altax on the screen. The appearance of this harmful impurity would seem to signal the necessity to change the oil. Not every mechanic could discover altax, cracks in engine parts, or the initial stage of corrosion from barely noticeable signs. The lessons of the chief of the flight TECh and experienced technicians officers V. Gavrilyuk, N. Yel'kin, and others as well as demonstration lessons helped the personnel to learn to accomplish all technological operations confidently during ground preparations.

In winter, as is known, the possibility that foreign objects will land in the air intakes of the engines increases. On the recommendation of the unit's methodological council, additional inspections of the aviation equipment have been introduced in the squadron, monitoring the condition of the helicopter hardstands has been intensified, and accounting for and storage of tools and ground equipment have been improved. At the same time, at each critique of a flight shift the chiefs note how the aviators observe the requirements of technical performance and precautionary measures when working in places of difficult access and at the upper points of the helicopter. On one of the critiques, an experienced technician and experienced mechanic were admonished because they performed work on an engine having poorly cleaned snow from their footwear and they did not ensure themselves against falling. They and other specialists were reminded of the consequences which could result from such negligence and disregard of safety measures.

With the intensification of frosts or a sudden drop in the temperature of the outside air it is necessary to repeat several operations despite the fact that they were accomplished on servicing day. For example, a second check of the opening and closing of the air bleed valves provides the opportunity to determine the amount of shrinkage of the regulator pump temperature bulb and, thereby, to prevent a change in the characteristics and the appearance of surges. We perform such an operation and those similar to it in addition to common prescribed servicing.

Our rationalizers have developed the means and methods for tool monitoring which are extremely effective at winter field airfields. Thus, Warrant Officer [praporshchik] A. Krit has made an original device to inspect the blades of the input guide ring and the first stage of the turbocompressor. It is willingly used by the flight and other technicians and also by the regiment's TECh specialists. This device was selected for demonstration at the exhibition of the works of young innovators at the Exhibition of Achievements of the National Economy of the USSR.

In the practice of operating the helicopters, there were cases where individual flight crews could not prevent the failure of an engine even with insignificant malfunctions in the operation of its assemblies and systems. The reasons were the formal conduct of training in the start-up and testing of power plants under low-temperature conditions and the aviator's lack of the necessary skills. And failure to maintain the flight conditions envisioned by the instructions led to the premature wear of the bearing and the tightening of the engine.

These errors were examined in detail. In lectures and talks, the regiment's engineers explained to the pilots the physical essence of restrictions in the operation of the power plant, especially concerning temporary tolerances in various modes. Flight and crew commanders began to conduct drills in the helicopter cabins more often. The check of operation of the power plant on the ground and in the air using recorders improved. The data from this equipment are used during technical critiques and on planned lessons.

...Winter did not catch our aviators unawares. Using the experience which had been accumulated, the aviation specialists are accomplishing with honor the difficult tasks posed for the military collectives.

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## AIRFIELD DRIVERS' WORK DISCUSSED

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pp 32-33

[Article by Lt Col Ye. Aparin: "Drivers on the Airfield"]

[Text] The weather forecasters warned the aviators about the intensification of the wind and the possibility of rain in the second half of the day. But nevertheless, the bad weather arrived earlier, as often happens in our territories. A gusty wind began to blow and big drops began to patter on the concrete and surfaces of the fighters. Nevertheless, the rhythm of the flight shift was not disrupted. Having taken precautionary measures, the specialists prepared the aircraft for repeated takeoff efficiently and with high quality.

The subordinates of Captain V. Garkusha--the drivers of special vehicles--worked clearly. On the first request of the technicians, they delivered fuel and liquified and compressed gases to the airplanes and they supplied electric power. When summing up the results of the shift, the regimental commander gave a high grade to the labor of the men of the mechanical transport equipment subunits.

This leading combat collective accomplishes difficult and diverse missions. It has been the leader in socialist competition in the separate airfield technical maintenance battalion for a long time. Captain Garkusha's subordinates maintain the motor vehicle equipment in constant readiness to move out to the airfield and, together with the aviation specialists, participate in the ground preparation of the fighters and the check of the onboard systems and automatic devices. The drivers tow aircraft and deliver various loads to the hardstands. The clear rhythm and flight safety depend on their work to a great extent.

The specialists of the electric-gas equipment company understand this well. Officers V. Garkusha, O. Sizov, and B. Prasolov conduct important indoctrinational work with the men. Supported by the party and Komsomol organizations and the public, the leaders of the subunits are doing everything to eliminate violations of military discipline and the rules for the movement of motor transport over the airfield and along the airplanes. In the unit, they do not remember a case where the regimental commander or another chief relieved a military driver from his work for failure to observe safety measures.



The weather in our region often sets up difficult tests for people, especially in winter months of combat training. One need only weaken briefly or lose self-control and various surprises may arise. Thus, in a similar subunit at another airfield, preconditions for flight accidents through the fault of the drivers nearly occurred. During the rain, one driver crossed the runway, not noting the warning signals of the guards, while another almost collided with an aircraft during an approach for recharging with air--he did not consider the increase in braking distance on the wet asphalt. Some drivers arbitrarily changed their route of movement, slid off onto the dirt, and then, without cleaning the wheels of the vehicles, carried dirt onto the concrete.

There are no such violations among Captain Garkusha's subordinates. In the subunit, much is being done to maintain discipline at a high level. On lessons and during talks with the personnel and critiques of flight shifts the company commander and platoon leaders systematically remind their subordinates of the requirements of the Soviet Minister of Defense about raising combat readiness and ensuring flight safety. Displays with graphic agitation materials, including extracts from regulations, orders, and other guiding documents, are set up in the barracks, motor pool, and classrooms for special training.

Questions of strengthening discipline are constantly discussed at party and Komsomol meetings and bureau sessions. Warrant Officers [praporshchik] L. Novichenko and N. Divakov often speak at them. Both often perform service at the technical control point and check the work of the drivers on the airfield. Therefore, they have the opportunity to analyze and generalize typical remarks. The warrant officers willingly share their experience with their comrades and advise them on what to do to prevent failures of equipment and delays in moving out for flights.

It is noteworthy that in monitoring the motor vehicles Warrant Officers Novichenko and Divakov do not limit themselves to the mandatory check of the adjustment of the brakes, the camber and toe-in of the wheels, and the engine acceleration, but they ask the drivers questions pertaining to technical servicing or prescribed maintenance and are interested in what monitoring equipment they used. The warrant officers remind the men of the special features of a specific flight shift and expected changes in the weather situation. All this forces the drivers to service and operate the equipment with high responsibility, to study their duties more deeply, and to refer to the technical descriptions and other documents more often.

A traffic safety corner has been set up in the subunit where, on a special mockup the driver, prior to going out for the flights, can refine the route from the hardstand to the position and review the rules for approaching the aircraft and leaving it, grounding the vehicle, securing it with additional chocks, and so forth. The company commander or his deputy check how this knowledge has been assimilated during the briefing of the drivers. The duty officer for airfield-technical support of the flights strictly follows the observance of safety measures.

One day Senior Lieutenant B. Prasolov (by the way, the best duty officer for airfield-technical support) noticed that during flights some drivers warm themselves in the cabs, turning on the motors. Obviously, they do not understand that this may lead to poisoning by exhaust gases. In addition, fuel is over-expended. But you see, the struggle to save fuel in the subunit is one of the points of socialist

obligations in the competition. The officer also directed attention to the fact that individual men handle tools carelessly: taking a wrench or screwdriver from a comrade, for example, they do not inform him of this. Or, forgetting the tool bag in the motor pool, they ride after it in a vehicle across the entire airfield.

The command personnel spoke of these shortcomings at a critique of the support of a flight shift, explaining how they are reflected in the common deeds of the aviators. The officers invited to the subunit a highly qualified aviation specialist and chief of the technical maintenance unit of the flight, Senior Lieutenant of Technical Service Ye. Surovtsev. He told the vehicle operators the significance which is had by the care of tools and checking equipment, and he presented many instructive examples. He advised them how better to store and use tools, how to lubricate them, and where to place the seal.

Medical worker officer V. Novozhilov reminded the men of precautionary measures when handling fuels and lubricants which contain chemical additives. He cautioned against misfortune those drivers who have the habit of warming themselves in the vehicle cabs with the motors running.

An important place in the activity of the company's officers is occupied by propagandizing the experience of the best drivers who serve as examples of execution and skill, such as, for example, Junior Sergeant D. Mukhametzyanov. He works on the airfield mobile generating set, has a third-class rating, but performs many duties of a second-class driver with excellent indices. According to the results of the socialist competition for the summer training period he was awarded the "Best Driver" challenge pennant.

During a practical lesson conducted by Warrant Officer N. Divakov, Junior Sergeant Mukhametzyanov demonstrated the procedures for inspecting a vehicle and the equipment installed on the chassis and adjustment of the current parameters. Taking a place near a fighter, he secured the vehicle and accomplished various instructions of the technician for electronic equipment. And then he showed how to tow an airplane to distant cover more conveniently.

Such lessons help the driver personnel, especially new arrivals, to master better the requirements of the guidance documents, commanders, and chiefs. Recently, the company received young drivers as replacements. Using the experience which has been accumulated, the officers, warrant officers, and sergeants help them to join the ranks more quickly, inculcate in them execution and industriousness, and instill technical style. They see that already from the first days of the new training year the company's combat collective sets a high pace in the reliable support of flights.

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## NEED FOR ATTENTION TO DETAIL IN AIRCRAFT SERVICING STRESSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 83 (signed to press 3 Dec 82)  
p 34

[Article by Engr-Lt Col P. Karpenko and Engr-Maj Yu. Kuz'min: "There Could Be No Failure..."]

[Text] The flying day ended. Several aircraft were still in the air, including the airplane piloted by first-class military pilot Captain I. Maksimov. The crew flew it around after routine prescribed maintenance.

There were no comments on the operation of the equipment. And then the landing. The heavy aircraft, touching the runway lightly, began its run. The pilots turned on the thrust reversals of the outboard engines. The airplane suddenly lurched to the left. But Captain Maksimov was able to hold the aircraft on the strip.

"Failure of the right reversal," the flight technician reported to the commander.

Signal lights on the signal panel also indicated this. The crew retracted the thrust reversals. The aircraft ran a little more than proper along the strip and taxied safely onto the taxiway.

Just what had occurred? For only about three hours earlier the specialists of the TECh [technical maintenance unit] under the direction of Engineer-Captain V. Orlov had checked the operation of all systems. They had no remarks then. But here, on the hardstand, the aviators opened the engine cowlings and soon discovered: the control rod of the reversal device had become disconnected. This occurred because one of the specialists, not having sufficient experience, committed an error when assembling the threaded connections. The lock wire broke because of vibration and the nut spontaneously became unscrewed in flight.

A rare case; at least nothing like it had been previously encountered in the regiment. For the design of the aircraft envisioned everything to prevent the spontaneous unscrewing of nuts, screws, and other threaded elements. Various types of connection clampings are used: castellated self-locking nuts, locking using cotter pins, lock washers, special wire, and so forth.

The technical documents describe in detail all the rules for the employment of locking connections. In particular, know-how reminds us that when fastening a nut with cotter pins its slot should not be brought under the opening of the cotter pin or bolt,

unscrewing it. If the opening nevertheless does not coincide with the slot, either the nut should be jogged, if this does not require great efforts which may cause over-stressing of the cotter pin (bolt), or it should be replaced altogether. Cotter pins which do not meet the technical specifications should not be used. It is categorically forbidden to use them over again.

Experience in the operation of aviation equipment also shows: the technician or mechanic must not permit the pull-through of the lock wire straight away, without an incline in the direction of turning the nut. It should be tightly drawn and should not have traces of twisting, cracks, or fractures. The wire is coiled into four to six turns per centimeter, without a gap between them. The ends which remain are tucked in in the direction of the engine housing (this pertains to the locking of the union nuts and couplings on the engine). It is not permitted to use the wire again.

These and other problems were examined in detail at a thematic critique conducted with the technical engineering personnel. Engineer-Major S. Tikhonov and other leaders of the Air Force Engineer Service reminded the specialists of the technology. In particular, they stressed that the locking of the nuts and screws can be accomplished only with special washers with one or several clearance lugs which should lay tightly against the locking surfaces. Drills were organized during which highly qualified technicians demonstrated the most difficult types of fastening, for example, of washers with two clearance lugs on two edges along both sides of the screw (bolt) head as well as on one. They recalled what should be done so that there are no cracks and fractures at the point of bending of the washer clearance lug and so that the clearance lugs do not project above the head of the screw (bolt).

"Why did we have the precondition for a flying accident?" asked Engineer Major Tikhonov, and he answered himself: "The mechanic did not tighten the nut as far as possible and did not eliminate the gap in the surfaces being joined."

The engineer explained how one should consider the special features in fastening threaded parts depending on the positioning and type of connections.

Of course, the leaders of the Air Force Engineer Service did not limit themselves to a technical critique and drills alone. During practical demonstration lessons they organized an exchange of experiences of highly-rated aviation specialists. In the squadrons, diagrams were made and displays were drawn up with excerpts from the instructions on operation which recalled the basic locking methods. And the rationalizers demonstrated the most difficult fastenings of bolts and locks on assemblies which had been written off and they clearly indicated the reasons for errors.

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## BIOGRAPHICAL DATA ON AIRCRAFT DESIGNER P. O. SUKHOY

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pp 38-39

[Article by Col V. Lebedev: "Designer's Handwriting"]

[Text] At the beginning of the 1960's, airplanes of an unusual design--similar to a missile--arrived in the inventory of our aviation unit. I remember the elevated spirit with which the aviators rose into the sky! Each independent sortie in the new fighter was transformed into a genuine celebration. It was the Su aircraft created by P. O. Sukhoy's design office.

Pavel Osipovich Sukhoy travelled a long life's path. He worked for some time as a draftsman in the Central Aero-Hydrodynamic Institute [TsAGI] and there he defended his graduation design. In TsAGI he met A. Tupolev and created the I-4 aircraft under his direction. His associates could hardly assume that working next to them was the future twice Hero of Socialist Labor and winner of the Lenin and State Prizes. Pavel Osipovich devoted more than half a century of his brilliant, intense, and creative life to aircraft construction. Winged machines of several types were constructed under his direction.

Perhaps it is difficult to find a more important profession than aircraft designer. He not only creates machines of a new type which meet the requirements of the times. For him, it is no less important to ensure the high operating reliability of the on-board systems, and this means that the designer must possess a rich imagination, a keen sense of what is new, and the ability to glance sagaciously into the future. For an aircraft is in production for a long time--from the preparation of the design until it reaches the line units. It is not enough that it should not become obsolete while it is entering the inventory (for aviation equipment develops very rapidly). It is necessary that it serve people for a long time.

Colossal labor is expended before the ideas of a new model of aircraft become reality and receive the approval of the aviators. Here a special place belongs to the general designer on whose engineering erudition and breadth of creative scope and organizational quality the fate of an airplane generated within the walls of the design office depends to a decisive degree. Pavel Osipovich belonged namely to such a Pleiad of designers--genuine innovators who are distinguished by boldness of thought and originality of solutions. His abilities were manifested brilliantly back when creating the I-4 fighter at the end of the 1920's, at that difficult time

when the aviation industry had just been created. At times indomitable will and great physical strain were required of the designers, technicians, and workers. And Sukhoy showed himself as a person of tremendous industriousness with original engineering thinking who was bold and persistent in the solution of difficult scientific and technical problems. He was distinguished by purposefulness, initiative, and the ability to introduce advanced technology boldly into aircraft construction.

Pavel Osipovich was a little more than 30 years of age when the I-4 (ANT-5) aircraft underwent tests. The fighter was produced in several modifications and was in the inventory of our aviation for a long time. To increase flight speed, the designer employed jet boosters on it. Two assemblies with three powder rockets each were suspended on each aircraft.

The single-seat I-14 fighter designed by a brigade under the direction of Sukhoy appeared several years later. It was a monoplane with a low-set wing and a landing gear which was retractable in the air. It was a novelty then. Tests confirmed that this fighter can be recommended for the inventory of the Soviet Air Forces. True, there were also several drawbacks--speed restrictions and a delay in coming out of a spin. This led to a reduction in the aircraft's production. Moreover, in this period work was concluded on the I-16 fighter which possessed unquestionably better flight qualities. This aircraft also began to reach the inventory of fighter aviation.

The complexity in the aircraft designer's activity is that he is required constantly to consider many factors, including the appearance of new materials which are suitable in aircraft construction and the improvement in production technology. In order to avoid failures it is important for him to have available sufficient information on the development of aviation equipment abroad and to see clearly the prospects several years ahead.

In the fall of 1930, to study the organization of aircraft construction abroad the Soviet government sent Pavel Osipovich Sukhoy on a long business trip to Germany and Italy. The designer returned from the trip with the firm conviction that the future of aviation is behind airplanes with a monoplane design. Having become the head of a brigade of the design department of an experimental aircraft construction plant in the spring of 1932, he tried to put these ideas into practice.

In that period, under the leadership of the Leninist party the Country of Soviets created a powerful socialist industry at high rates. As a result of the people's selfless labor, the production of special materials and heat-resistant alloys, which received broad application in aviation equipment, was set up.

The brigade of young specialists led by Sukhoy worked creatively and with great enthusiasm. At this time the Soviet government approved the recommendation of the Revolutionary Military Council (RVS) of the USSR concerning the organization of a flight to maximum range in the summer of 1932 and decreed the construction of the ANT-25 aircraft for this purpose (designed by A. Tupolev).

Sukhoy's brigade completed work on the design of the new machine on time and soon the RD (ANT-25) aircraft successfully accomplished its first flight. At almost the

same time, test pilot M. Gromov took off in a duplicate ANT-25. Both aircraft were almost identical in design, but their flight characteristics were different. The designer and his assistants concentrated all their attention on improving the duplicate aircraft with an M-34R motor. In the first half of 1934, the tests were continued. In the course of them the duplicate aircraft demonstrated a range of 13,020 kilometers. Soviet pilots began record flights.

In December 1933, in connection with TsAGI's 15th anniversary, by decree of the USSR Central Executive Committee Pavel Osipovich was awarded the Order of the Red Star for exceptional services in the field of creating light metal aircraft, and in August 1936 he was awarded the Order of the "Badge of Honor" for participation in the preparation and organization of a nonstop flight of the ANT-25 aircraft.

In the summer of 1937, the crew of V. Chkalov accomplished the legendary flight from Moscow to the United States across the North Pole in an ANT-25. This flight showed the successes of Soviet aviation technology. Our valiant pilots demonstrated high skill and great courage. The ANT-25 represented the Country of Soviets at the 15th air show in Paris.

In the second half of the 1930's, under the direction of Pavel Osipovich the DB-2B (ANT-37bis) was created. The M-86 engine was installed on it, the capacity of the fuel tanks was increased, the cockpit was reequipped for record flight, and the armament was removed. On this machine under the name "Rodina" [Motherland], female pilots V. Grizodubova, P. Osipenko, and M. Raskova set a world record for distance and duration of flight for female crews. They accomplished a flight over the route of Moscow-Amgun' (Kerbi area), covering a distance of 5,947 kilometers in 26 hours and 30 minutes. For the preparation of this flight, Sukhoy was awarded the Order of the Labor Red Banner.

At the beginning of 1936, a competition was announced in the Air Forces for the development of a reconnaissance aircraft and light bomber under the name "Ivanov." Three collectives began the preparation of a design: of I. Neman, N. Polikarpov, and P. Sukhoy. Sukhoy's brigade worked under the general direction of A. Tupolev. The initial design received the designation of ANT-51.

On 1 July 1936, the experimental design plant (ZOK), to which Pavel Osipovich was assigned as chief of the design department, was separated from TsAGI as an independent enterprise of the aviation industry. The assignment for the production of the "Ivanov" aircraft thus remained Sukhoy's. In August 1937, the famous test pilot M. Gromov accomplished the first flight, and the state tests of this machine were completed in the spring of the following year. In the report it was noted that the "'Ivanov' airplane designed by engineer P. Sukhoy is the first model of an airplane of Soviet industry which was made in a quality manner."

In 1938, Sukhoy modified this aircraft, replacing the M-62 engine by the M-87A with a power of 950 hp and the VISH-5 propeller by the VISH-23. The "Ivanov" developed a maximum speed of 470 kilometers per hour and its flight range reached 1,160 kilometers. In creating this aircraft, Pavel Osipovich showed himself to be a genuine innovator and bold experimenter. Assemblies made of aluminum alloys by the swaging or casting methods found broad application in the design of the aircraft. The method employed for the production of assemblies and parts opened up great opportunities for the mass line production of airplanes.

Sukhoi worked with great inspiration and thoughtfully on the design of each aircraft, skillfully using the experience of the leading aircraft designers and attentively studying the achievements of world practice in aircraft construction. During those years, a struggle was under way first of all for speed, altitude, and distance of flight and for more powerful armament. The leaders of the design office also passed a severe test. The creative thought of Pavel Osipovich knew no rest. The associates whom he led worked with good return, realizing in practical deeds the ideas of the chief designer.

At the beginning of 1940, a modified BB-1 aircraft equipped with a 1,100 hp air-cooled engine arrived for state tests. After modification the bomber received the designation Su-2 and was taken into the inventory. Its flight range was 850 kilometers and maximum speed at the ground was 378 kilometers per hour. Altogether, 500 such aircraft were produced. The Su-2 was employed as an attack aircraft and light bomber in the Great Patriotic War. The aircraft was armed with four 7.62-mm machineguns and 10 82- or 132-mm rocket-propelled projectiles and could lift 400-600 kilograms of bombs.

The design office headed by P. O. Sukhoi, in continuing to work persistently on the creation of new combat aircraft, constructed the two-seat armored Su-6 attack aircraft in 1942. It had powerful armament: two 37-mm cannons, three machineguns, and was able to carry 200 kilograms of bombs. For the development of the Su-6, in 1943 P. O. Sukhoi was awarded the State Prize 1st degree.

But Pavel Osipovich already lived with new creative plans and dreamed of aircraft with higher flight performance: for the day of the jet age was breaking.... The airplanes of the future opened broad opportunities for science and technology in the further development of aviation and the tasks which it was accomplishing.

The year 1944 passed. It was then, in the year of our great victories on the fronts of the Great Patriotic War, that the design office led by P. O. Sukhoi completed work on the Su-5 fighter aircraft with a combined power plant. It consisted of a VK-107A piston engine and an air-breathing air-injection engine with a thrust of 1,300 kg. In the spring of 1945, the Su-5 climbed into the air for the first time and developed a speed of 793 kilometers per hour.

Immediately after the war, Sukhoi's OKB [special design office] began the creation of jet aircraft. The Su-9 with two turbojet engines was constructed in a comparatively short time. For the first time in the practice of Soviet aircraft construction, the designers employed on it hydraulic actuators in the control system, a pilot's ejection seat, and a landing drag chute. On this aircraft, specialists tested solid-fuel boosters located beneath the fuselage.

The designer's handwriting of P. O. Sukhoi constantly improved. Based on the Su-9 the Su-11 multipurpose fighter was developed with two TR-1 engines and powerful armament: one 37-mm and two 23-mm cannons.

Right after this, the OKB received the task to create a new type of aircraft which meets higher requirements. In the shortest time, Pavel Osipovich Sukhoi managed to prepare the design of a single-seat Su-15 aircraft which underwent tests in 1948.



This aircraft had an airtight cockpit and was equipped with an onboard radar. Booster control of the ailerons, rudders, and air brakes was employed on it.

Working on the designs of new aircraft, P. O. Sukhoy strived to find an original technical solution, provide high flight and combat characteristics and reliability, and create favorable conditions for the crew to work in the air. Using the results of studies, the design office of P. O. Sukhoy created a single-seat high-speed frontal fighter with one turbojet engine and a wing with great sweep in 1953-1954. On this aircraft, a controllable air intake and all-moving horizontal tail were used for the first time in Soviet aircraft construction.

In the course of its tests, a speed of 2,170 kilometers per hour--almost twice the speed of sound--was achieved in our country for the first time. Despite the tremendous maximum speed, the aircraft was simple to handle. The test pilots gave it a high grade.

An unquestioned success of the OKB led by P. O. Sukhoy was the creation of the Su-7B multipurpose fighter. This aircraft was put into series production in the second half of the 1950's and has been in the inventory of our Armed Forces for more than 25 years. At the same time, the design office worked persistently on the design of an interceptor with a delta wing which would carry a radar, and to destroy aerial targets at various altitudes the pilot used air-to-air missiles.

With the breaking of the sound barrier and the attainment of a speed twice the speed of sound, the designers faced new problems in ensuring the stability and controllability of aircraft. In connection with the fact that aviation had approached the heat barrier, the necessity arose to cool and condition the air in the pilot's cockpit and cooling turbines were required which could ensure the normal operation of non-heat-resistant equipment in the aircraft's instrument compartment.

To solve a number of scientific and technical problems which would further the creation of series supersonic airplanes of the future, in the middle of the 1950's and the beginning of the 1960's experimental aircraft of several types were developed in P. O. Sukhoy's design office. In 1957, a two-seat fighter-interceptor with one turbojet engine was created. Lateral adjustable intakes were employed on it. Another special feature of the aircraft: a unit containing 50 free rocket projectiles was placed in the nose of the fuselage.

In the course of the tests of this aircraft, rather effective results were obtained which were subsequently used in the creation of new types of aircraft. In particular, P. Sukhoy's OKB constructed an aircraft intended for the maximum flight speed. Original technological solutions were employed in its design: There was no set of stringers in the fuselage and the rear part was made of titanium alloys and steel and was all-welded. In a series T-431 Hero of the Soviet Union test pilot V. Il'yushin established the world's record for flight altitude--28,852 meters, and in 1962--the absolute horizontal-flight altitude record--21,270 meters.

P. O. Sukhoy (1895-1975) made a large contribution to the development and improvement of Soviet jet aviation. He was the author of 50 designs of airplanes, and 34 of them were tested and built. Our contemporary aviation has airplanes with variable wing geometry, one of the creators of which was Pavel Osipovich. Sukhoy's aircraft are in combat formation even today.

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## SATELLITE ORBITS DISCUSSED

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[Article by Engr-Col V. Gor'kov, candidate of technical sciences: "Orbits of Satellites"; conclusion, see No 12, 1982, for beginning]

[Text] The possibility of employing satellites for navigation became clear back in 1957 when tracking the first artificial Earth satellites. In analyzing the signals which had been received, specialists noted that sufficiently complete information about the parameters of a satellite's orbit can be extracted from data about the frequency shift. Further studies showed that all necessary calculations can be conducted from the results of satellite tracking during its flight above the observer. It was established simultaneously that on the basis of precise information on the parameters of the orbit it is also easy to determine the coordinates of the tracking station's location. These results served as the origin of studies and experiments at first and then as the reason for the creation of satellite navigation systems.

Two groups of methods for navigation measurements exist: successive and simultaneous. The former are simplest and do not require the especially precise synchronization of the time scales of the onboard clocks. Two coordinates--latitude and longitude--can be determined with sufficient reliability from measurements at an interval of 3-16 minutes. The third--altitude--is found by conducting measurements only on several orbital passes. These methods, consequently, are suitable for determining the coordinates of stationary or slightly-moving objects. In such a case, the altitude of the orbit should be about 1,000 kilometers. To ensure continuity of navigation determinations, hundreds of satellites with orbital inclinations close to polar are required. In practice, their number is considerably less; therefore, the intervals between observations are 30 or more minutes depending on the latitude.

The methods of simultaneous navigation measurements are free of the former's shortcomings and permit accomplishing navigation determinations virtually in real time, in which regard for users having even high rates of movement (airplane, satellite). A higher orbit is required for these methods. The greater the altitude of the satellite's orbit, the larger the zone of its visibility and, consequently, the fewer the satellites required for continuous navigation determinations. An orbit with an altitude of 15,000-20,000 kilometers would be most expedient. Its further increase will not lead to a significant reduction in the number of satellites or a growth in the zone of visibility. At the same time, a large power potential of the

satellite-Earth radio link is required, which leads to an increase in the cost of the transceiver equipment. As regards the inclination of the orbital plane, the global nature of observation is ensured even at 55-65 degrees. And this provides a substantial savings in fuel in comparison with the injection of the satellite into a polar orbit.

The methods of the second group impose requirements for the simultaneous visibility of four satellites on the kinematic structure of the "constellation." Not only their number, but also their mutual position is important. In fact, the necessary accuracy is attained only in the case of intersection of the user-satellite lines of sighting at a sufficiently large angle. Therefore, it is desirable that the number of simultaneously observable satellites be greater than four. In addition, under the action of various forces, including the gravity of the Moon and the Sun, the initial structures of the system will change with time. The required position is maintained by periodic corrections or by some reserve of satellites in orbit.

At the UN Conference on the Study and Use of Outer Space for Peaceful Purposes which took place in Vienna in August 1982, one of the main questions was that of the study of the Earth's nature by remote methods. By now, not individual peoples, but dozens of peoples and states understood the possibility of deriving benefit from this direction of space studies. The arsenal of technical means for this is rather broad: photo-, cinema-, and television cameras, instruments for infrared and radiovision, and radar and laser locators.

Among the possible methods for recording images of the Earth's surface from space, a leading place is occupied by photography since it is most informative, unique, and accessible to visual analysis.

The conditions for photography of the areas beneath the satellites depend on many reasons but their illumination, perhaps, should be considered as one of the basic ones. And it depends on the attitude of the satellite's orbital plane toward the Sun's rays. If they penetrate it at a right angle, the points beneath the satellite are on the line of the terminator. This is the most unfavorable condition, since during the entire pass (period of revolution) the areas subject to photography find themselves on the boundary of day and night, that is, under twilight conditions.

The smaller the angle at which the Sun's rays are incident to the orbital plane, the more favorable do the conditions for photography become. However, it is important not only to find a favorable situation, but also to preserve it for the time of the satellite's active existence. And this, as theory shows, depends essentially on the parameters of the orbit and, in particular, on the inclination. For example, with an inclination of 51 degrees the time of constant illumination of the area beneath the satellite by the Sun is about 10 days, and with an inclination of 81 degrees--more than a month.

This occurs because of the Earth's asphericity. The orbit seems to turn in its plane and simultaneously rotates around the Earth's axis. Here, the orbital plane with an inclination from zero to 90 degrees precesses in a westerly direction, and higher--in an easterly direction. And such rotation is absent only with polar orbits (inclination of 90 degrees).

Utilizing this circumstance, an orbit is sought which would accomplish a complete revolution along the equator in one year. Therefore, it was called solar-synchronous. Being located on it, on each pass the satellite appears at the very same latitude at the very same local time. The conditions of synchronization cannot be exactly satisfied. But they can be realized with an accuracy acceptable for practice.

It is known that the Earth moves around the Sun irregularly. In the summer its angular velocity is less, and in the winter, more. The same can also be said about the Sun's apparent motion. If this true motion is replaced by the average motion, our star will move along the equator from west to east with a rate of about one degree.

On the other hand, a direct relation exists between the inclination and altitude (period) which satisfies the condition of synchronization of motion together with the Sun. In which regard, the greater the satellite's period of revolution, the greater its altitude. Thus, the satellite "Meteor-Priroda" [Meteor-Nature] has an inclination of 98 degrees with a period of rotation of 97.5 minutes. If the inclination is increased to 100 degrees, the period increases to 103 minutes, which is equivalent to a rise in altitude. Naturally, in both cases the rate of orbital precession will be identical. Thus, the Earth itself and its natural properties help us in the study and use of outer space.

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